VICTORIAN INSTITUTE OF TECHNOLOGY

Master of Information Technology & Systems

Unit Descriptor

February 2018

(concise web version)

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1) MITS4001: Business Information Systems

UNIT DESCRIPTION:

This unit provides the necessary foundation in Business-IT alignment, an understanding of which is essential for successful implementation of business transformation. The focus of the unit is twofold: (i) To provide a comprehensive and in-depth understanding of Information Technology components such as computing hardware, software, and networking and applications, and (ii) To provide an understanding of business, both the strategic aspects and the operational aspects with a view to laying foundations for BIS. This subject relates how information systems improve profitability and resource efficiency. The unit discusses conceptual architecture, and its impact on process, people and organization from an information technology context. Using realistic case studies, the unit illustrates typical business and management functions including finance, accounting, HRM, CRM, SCM which is required to develop Business IT Systems.

Students will be prepared to evaluate the strategic and operational roles of information systems in organizations. Students will also be able to critically analyse the purpose, components, and challenges related to common business information systems by conducting research on existing published case studies. In addition, the students will be adequately prepared on the foundations of IT and Business, and how they align and complement each other which is essential in learning the more advanced units that follow in the course.

Pre-requisites:
Nil

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 4

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly to satisfy the study and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's home assignments and to provide guidance on tutorials and practical work.

CONTENTS:

- **Introduction to Business Information Systems**:
    - Overview of key functional areas of an organization including administration, finance, human resources, information systems, business operations, sales and marketing.
    - Business and technical needs for information technology usage in organizations and the key functional areas above
    - Components of IT ecosystem such as hardware, software, databases and business intelligence.
    - Networks, telecommunications, the Internet, enterprise BIS and functional BIS.
- **Introduction to IT Infrastructure**
    - Overview of Hardware: Parts of Computer, I/O Devices, Printing and Storage, Processors
    - System Software: Operating Systems, Functions of OS, Compilers, Drivers
    - Application Software: Databases, Spreadsheets, Graphic Packages, Multimedia, ERP
- **Business Information Systems Development**:
    - Planning, developing and maintaining the business information systems for effective automation of key business processes.
    - Understanding Business Goals and Priorities and devising organisations IT strategy through Business-IT Alignment
    - Nature and use of financial accounting systems and portfolio management of CAPEX and OPEX funding for organizations.
    - Project management, analysis, design, build, implementation, maintenance and change management.
- **Business Information Systems Management**:
    - Using eCommerce and mCommerce (commercial transactions conducted electronically by mobile phone) for buying and selling information, products and services via the Internet and electronic data interchange (EDI); the potential benefits and drawbacks;
    - Understanding business strategy and how it is supported by information system strategy.
    - Information systems management, security concerns, end-user computing and providing end-user services.
- **Emerging Trends in Business Systems.**
    - Overview of Distributed Enterprise Systems and Enterprise Application Integration
    - Overview of Cloud based systems and their business impact.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Adapt information systems to strategically achieve organisational goals and be able to design, develop and manage IT systems implementation to achieve Business IT Alignment.
- Develop an IT Plan that designs, implements and manages the technology supporting these information systems including computing devices, storage and processing (both systems processing and application processing);
- Identify, synthesize and model individual functions of a database system to be used for organization data management and decision making;
- Apply appropriate eCommerce or mCommerce business operations and activities that contribute to effective business productivity;

- Appraise an organization's competitive position by applying standards approaches and analyse activities/issues in recruitment, employment relations and performance management and explore emerging business trends through study of published research work.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	10%	
Research Study	Formative	10%	
Assignment	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as "hurdle", students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Bocij, Paul, and Simon Hickie. Business information systems: technology, development and management. Pearson education, fifth edition, 2015

Reference Book(s):

Laudon, Jane P., and Kenneth C. Laudon. *Essentials of business information systems*. Prentice-Hall, Inc., 2006.

Lehaney, Brian, Phil Lovett, and Mahmood Shah. Business information systems and technology: a primer. Routledge, 2011.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Gerow, Jennifer E., Jason Bennett Thatcher, and Varun Grover. "Six Types of IT-Business Strategic Alignment: An investigation of the constructs and their measurement." European Journal of Information Systems 24.5 (2015): 465-491.

Rosemann, Michael, and Jan vom Brocke. "The six core elements of business process management." Handbook on business process management 1. Springer Berlin Heidelberg, 2015. 105-122.

Bharadwaj, A., El Sawy, O. A., Pavlou, P. A., & Venkatraman, N. “Digital business strategy: toward a next generation of insights.” MIS Quarterly, 37(2) (2013): 471-482.

Baskerville, Richard L., and A. Trevor Wood-Harper. "A critical perspective on action research as a method for information systems research." Enacting Research Methods in Information Systems: Volume 2. Springer International Publishing, 2016. 169-190.

2) MITS4002: Object Oriented Software Development

UNIT DESCRIPTION:

This unit provides key concepts of object-oriented software development. It covers object oriented development fundamentals such as programming paradigms, abstraction, encapsulation, specialization, aggregation, polymorphism, exception handling and I/O stream management. The unit lays emphasis on professional style of coding including fail safe, efficient programs that adhere to industry and organisational standards such as unambiguous naming conventions, exception management and audit logging. The unit discusses the syntactic, structural and behavioural typing of OO systems. The unit discusses creation of user defined data structures and type systems using generic templates.

Students will be learning to implement systems employing object oriented programming techniques. Students will able to compare concepts and evaluate object oriented design paradigms. Students will gain competence to reflect upon various programming models and be able to independently assess the strengths and weaknesses of object-oriented programming and apply these in various software development contexts. Students would become proficient in object oriented programming and would be able to implement these in a suitable OO language such as Java or C# in addition to being able to adapt these concepts to modern evolving programming platforms such as PHP, JavaScript, Object C or Python.

In addition, students trained and assessed on advanced knowledge within the discipline through research in emerging OO trends and software patterns to prepare them to evolve further.

Pre-requisites:
Nil

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 4

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Introduction to Object Oriented Programming:**
  - Introduction to the key concepts of object oriented software
  - Implementation using a particular programming language (e.g., Java)
  - Programming constructs such as assignment, decision, looping.
- **Objects and Classes:**
  - Introduction to imperative programming and defining class structures.
  - Defining and distinguishing object state and behaviour.
  - Declaring and using primitive-type wrapper classes and user defined data types.
  - Defining and crafting methods with arguments and return values.
- **Object Oriented Design Concepts:**
  - Introduction to modularity, encapsulation, inheritance, information hiding, access modifiers, advantages of immutability, usage of static data and members.
  - Modelling relationships in objects such as associations, inheritance and aggregations.
- **Lifecycle of an Object**:
  - Constructors and object chaining.
  - Finalization, garbage collection, copying and cloning of objects.
  - Object level lifecycle management and activities.
- **Making Decisions and Looping**:
  - Evaluating Boolean expressions, understanding relational comparative operators, making selection using ranges and understanding operator precedence.
  - Understanding loop structure, crafting loops and nested loops, common loop application and mistakes.
- **Creating hierarchies and collaboration**:
  - Using inheritance (base, derived sealed and abstract classes) to build class hierarchies, casting, overloading, overriding methods and classes.
  - Polymorphism and multiple inheritance implementation. Parameterization, message passing and event driven programming.
  - Handling exceptions and responding to events. Understanding delegation and asynchronous messages.
- **Memory, Generalization and Design Patterns**:
  - Working with collections such as Arrays, Array List, Stacks and Queues.
  - Introduction to generics and templates.
  - Introduction to design patterns. Examples of simple programming design patterns.
- **Case Studies and Worked Examples**

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Demonstrate understanding of classes, constructors, objects, data types and instantiation; Convert data types using wrapper methods and objects.

- Independently analyse customer requirements and design object-oriented programs using scope, inheritance, and other design techniques; Create classes and objects that access variables and modifier keywords. Develop methods using parameters and return values.
- Demonstrate adaptability in building control and loop structures in an object-oriented environment; Demonstrate use of user defined data structures and array manipulation.
- Create object hierarchies using additional utility methods, application programming interfaces (API) and interfaces, in conjunction with existing classes and objects.
- Demonstrate usage of collection to access data structures effectively and compose full-fledged object-oriented applications.
- Extend the on object oriented concepts and design patterns introduced in lectures to carry out further research on a chosen object-oriented design pattern or emerging recent programming languages.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Practical Exercises	Formative	10%	
Tutorial Exercises	Formative	10%	
Research Study	Formative	5%	
Assignment	Summative	25%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. Further, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Lewis, J and Loftus W. Java software solutions: Foundations of Program Design, Pearson Ed. 7 ed., 2012

Weisfeld, Matt. The object-oriented thought process. Pearson Education, Fourth Edition, 2013.

Reference Book(s):

Clark, Dan, and Jeff Sanders. Beginning C# object-oriented programming. Apress, 2011.

Schildt, Herbert. Java 7: A Beginner's Guide. McGraw-Hill, Inc., 2014.

Erich Gamma, Richard Helm, Ralph Johnson, John Vlissides, Grady Booch, Design Patterns: Elements of Reusable Object-Oriented Software, Addison-Wesley, 1995.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Fernández, Maribel. "Introduction." Programming Languages and Operational Semantics. Springer London, 2014. 3-19.

Smith, Ben. "Object-Oriented Programming." Advanced ActionScript 3. Apress, 2015. 1-23.

Odersky, Martin, and Tiark Rompf. "Unifying functional and object-oriented programming with scala." Communications of the ACM 57.4 (2014): 76-86.

3) MITS4003: Database Systems

UNIT DESCRIPTION:

This unit provides necessary concepts for a good understanding of database models, systems, and languages, through to advanced knowledge within the discipline. The unit includes database concepts, hierarchical data representations and the realization of those concepts using the relational data model and its operators. This unit discusses data modelling, data structure design and Structured Query Language (SQL) used in relational databases. The unit also presents the functions of the Database Management System (DBMS) and of the related administrative activities. Systematic methodology for relational database design using entity relationship diagrams and normalization of data are covered in detail. Students will be introduced to a subset of SQL using a selected database platform.

Students will be able to synthesize enterprise data requirements and craft entity relationship diagrams. They can also model the physical data structure and normalise the relationship based on the application's functional dependency needs. In addition, they would be competent to perform complex data retrieval and carry out advanced data manipulation using SQL. Students would be able to use the knowledge and skills delivered in this unit to implement medium and large database systems for effectively storing and retrieving information for enterprise operations and decision-making purposes.

Students will be provided with the skills to develop advanced knowledge within the area of database systems. This is primarily through the ability to carry out research on emerging trends in data management such as Big Data to prepare themselves for more in-depth study in subsequent units of the course.

Pre-requisites:
Nil

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials.

Level of Unit
Level 4

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment

expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Introduction to Database Concepts:**
  - Characteristics, advantages and implications of the database approach to information systems in contrast with traditional integrated file systems.
  - Classification, architecture and roles involved in database systems. Topics also includes data models, schemas, instances, database languages and interfaces.
- **Relational Data Model**:
  - Relational modelling concepts, referential integrity, entity integrity, and other constraints.
  - Defining a relational schema from an ER diagram.
  - Performing update operations, transactions, and dealing with constraint violations.
- **Querying the database using SQL**:
  - Use of SQL to define a relational data model.
  - Basic and complex queries in SQL. Insert, delete and update statements in SQL.
  - Defining and using Views in SQL.
  - Implement security with Grant/Revoke.
  - Cursors, dynamic SQL, stored procedures. Set operators, join operators, sub-queries and correlated queries, SQL functions and procedural SQL.
- **Normalization**:
  - Definition of functional dependency, full functional dependency, transitive dependency and multi-valued dependency.
  - Definition of the normal forms from un-normalized through 4th normal form and how to apply the normalization process to recognize normal forms.
  - How to move a data model to a higher normal form and the issues of de-normalization as it applies to retrieval performance.
- **Entity Relationship Diagrams:**
  - Information analysis to identify query keys, candidate keys, entities, attributes, relationships and integrity constraints.
  - Entity relationship modelling as a means to represent information concepts. Extended entity relationship modelling related to specialization, generalization and inheritance.
- **Advanced & Emerging Database concepts**
  - Data storage concepts both conventional and cloud storage.
  - Data Warehousing and Data Mining.
  - Database security, Transaction processing, Distributed Databases, Replication concepts.
  - Database administration.
  - No SQL databases
- **Practical Experience with a selected Relational DBMS.**

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Synthesize user requirements/inputs and analyse the matching data processing needs, demonstrating adaptability to changing circumstances;

- Develop an enterprise data model that reflects the organization's fundamental business rules; refine the conceptual data model, including all entities, relationships, attributes, and business rules.
- Derive a physical design from the logical design taking into account application, hardware, operating system, and data communications networks requirements; further use of data manipulation language to query, update, and manage a database
- Identify functional dependencies, referential integrity, data integrity and security requirements; Further integrate and merge physical design by applying normalization techniques;
- Design and build a database system using the knowledge acquired in the unit as well as through further research on recent trends to demonstrate competence in various advanced tasks with regard to modelling, designing, and implementing a DBMS including Data warehousing, Data Management, DB Security.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Practical Exercises	Formative	5%	
Tutorial Exercises	Formative	15%	
Assignment (course + research)	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. Further, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Elmasri, Ramez, and Shamkant B. Navathe. *Fundamentals of database systems*. Pearson, Sixth Edition, 2014.

Reference Book(s):

Date CJ, Introduction to Database Systems, Pearson, 8th Ed, 2003.

Ramakrishnan, Raghu, and Johannes Gehrke. *Database management systems*. Osborne/McGraw-Hill, 2007.

Silberschatz, Abraham, Henry F. Korth, and S. Sudarshan. *Database system concepts*. Hightstown: McGraw-Hill, 2010.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Apanowicz, Cas Kazimierz, et al. "Method and system for storing, organizing and processing data in a relational database." U.S. Patent No. 8,838,593. 16 Sep. 2014.

Schaefer, Marvin, et al. "Customer requirements for security in relational database management." Database Security IX: Status and prospects (2016): 351.

Moniruzzaman, A. B. M., and Syed Akhter Hossain. "Nosql database: New era of databases for big data analytics-classification, characteristics and comparison." axis preprint arXiv:1307.0191 (2013).

4) MITS4004: IT Networking and Communication

UNIT DESCRIPTION:

This unit provides necessary advanced technical knowledge in data communications and network technology. It introduces various networking/communication media and provides in depth understanding of various techniques to accomplish reliable and efficient data communication. The unit describes the major transmission systems and networks along with the equipment, models and tools used to interconnect them. The unit discusses network protocols, standards, LANs, WANS, the Internet, intranet and networking applications. In addition, the unit elaborates the TCP/IP protocol suite and a number of Internet technologies.

The students will be able to apply their advanced knowledge to design robust network systems using industry standard practices and involving communication technology such as network components, transmission links, link control, protocols, network topologies, error detection and correction. Students will be able to recommend appropriate network management and implement network security for given application or organisation requirements. Students would be prepared to explore further to research into emerging wireless technologies and standards.

Pre-requisites:
Nil

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 4

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Introduction to Networking:**
    - Introduction to network technologies, telephone network and internet architecture.
    - Introduction to data communication, data transmission, data encoding, digital data communication techniques, asynchronous and synchronous transmission, error detection and correction codes.
- **Network Standards:**
    - Network technology based on a layered protocol stack.
    - Standards bodies, OSI 7-layer reference model. LANs, WANs, PANs, MANs, internetworks.
- **Transport & Network Layers**:
    - Protocols and mechanisms used in the Internet TCP/IP protocol suite, congestion control and principles of reliable data transfer protocols. Special emphasis on analysis of network and transport layer protocols.
    - The Internet Protocol (IP): Forwarding and Addressing in the Internet. Routing algorithm, broadcasting and multicasting.
- **Links, Access Networks, and LANs**:
    - The link layer, error-detection and correction techniques.
    - Description and advanced analysis of high speed LANS, wireless LANs, sensor networks, and metropolitan area networks.
    - LAN internetworking. Switched local area networks and link virtualisation.
- **Wireless and Mobile Networks**:
    - Wireless links and network characteristics. Wireless local area networks (802.11), wireless personal area networks (e.g., Bluetooth, Zigbee).
    - Mobility in the same IP subnet, cellular internet access and principles of mobility management.
- **Network Security:**
    - Security management in computer networks.
    - Network security standards.
    - Intrusion detection systems, anomaly detection, network forensics, application logging, auditing and digital immune systems.
- **Network Management & Applications:**
    - Network monitoring and management.
    - Signalling protocols for VOIP services, and Web-based services configuration.
    - Applications such as client/server, email, news groups, FTP, VOIP, telnet and terminal emulation.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Identify the operation of the protocols that are used inside the Internet and use the seven-layer model to classify networking topology, protocol and security needs.
- Evaluate LAN technology issues, including routing and flow control. Explain the difference between switches and routers. Build and troubleshoot Ethernet, Wi-Fi and Leased line networks. Connect networks with routers.
- Critically analyse specific processes and functions that apply to a layered network model, with specific reference to TCP/IP; Subnet a network using multi-level subnetting and provide a subnetted IP design based on a given topology or business profile;

- Apply the advanced knowledge gained to reflect on the security requirements of a network. Evaluate the issues that surround network applications such as quality of service (QoS) and network performance analysis. Be adaptable to changing requirements.
- Evaluate the business implications of the proposed network application through the use of a network performance simulator and recommend alternates that would improve on the network performance.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	10%	
Research Study	Formative	10%	
Assignment	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Kurose, J., and K. Ross., Computer Networks: A Top-Down Approach, Pearson, Sixth Edition, 2012.

Reference Book(s):

Tanenbaum, Andrew S., and David J. Wetherall. Computer Networks: Pearson New International Edition, 2013.

Stevens, Richard W. "TCP/IP Illustrated, Vol. 1 and 2 (Addison-Wesley Professional Computing Series)." (1994).

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Xylomenos, George, et al. "A survey of information-centric networking research." IEEE Communications Surveys & Tutorials 16.2 (2014): 1024-1049.

Kreutz, Diego, et al. "Software-defined networking: A comprehensive survey." Proceedings of the IEEE 103.1 (2015): 14-76.

5) MITS5001: IT Project Management

UNIT DESCRIPTION:

This unit covers essential IT project management techniques for managing medium to large scale IT projects such as enterprise software solutions project, IT infrastructure implementation project, IT outsourcing projects etc. The unit discusses process groups such as initiation, planning, execution, monitoring, control and closure. The unit introduces ten knowledge areas in IT project management such as scope management, time management, stakeholder management, quality management, costing, integration, resource management, communication, procurement processes and risk management.

On completion of the unit, students will gain competency to synthesise complex project parameters and apply IT PM framework, processes and knowledge to manage IT projects. Students will be able to independently employ appropriate tools and techniques necessary for project estimation, work breakdown structures, precedence analysis, scheduling, critical-path analysis, earned value management and cost-benefit analysis. As part of the unit, the students would be carrying out research on emerging PM practices and present their research review in form of class presentations.

Pre-requisites:
MITS4001
Students who have equivalent knowledge of the prerequisite units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials.

Level of Unit
Level 5

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and students' homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Overview of project management**:
    - Overview of managerial process that includes planning, organising, staffing, executing and controlling all the phases through the lifecycle of a project.
    - Review of financial forecasting, organisational behaviour and planning.
- **Key project management processes**:
    - Project management planning activities that include defining business case, establishing the project scope, refining set objectives, and defining the relevant course of action required to attain the defined objectives that the project was undertaken to achieve.
    - Theory behind authorization, specification, execution, change management, review, tracking and verification.
- **Planning, Time and Stakeholder Management**:
    - The processes and activities needed to identify, define, combine, unify, and coordinate the various processes among resource groups.
    - Project Management tools & techniques such as WBS, project networks, critical path method, PERT, EVM etc.,
    - Basics of project scope & time management required to ensure that the project includes only the work to complete successfully and finishes on time.
    - Project management strategies for effectively engagement of stakeholders in project decisions, interventions required, monitoring and execution.
- **Quality and Risk Management**:
    - Determining and implementing quality assurance policies, objectives, and responsibilities to ensure that stakeholder expectations are met.
    - Identify, plan, analyse risks involved in a project. Devise risk response strategies and implement control measures in place.
- **Effort/Cost estimation and Resources**:
    - Cost management including planning, estimating, budgeting, financing, funding, managing, and controlling costs so that the project can be completed within the approved budget.
    - Resource management which includes strategies behind people management tasks such as organize, manage, and lead the team.
- **Communication and Procurement**:
    - Communication processes involves planning, collection, creation, distribution, storage, retrieval, management, control, monitoring, and the ultimate disposition of project information.
    - Managing project procurement which includes the necessary processes to purchase or acquire products, services, or results needed from outside the project team.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Demonstrate ability to skilfully manage projects by putting to effective use various IT project management tools and techniques.
- Critically analyse project parameters and identify the key processes from the available project management book of knowledge in practical case scenarios.
- Independently analyse project flow, resources, timelines and budget requirements using PM Tools.
- Apply emerging PM principles and state of the art tools to manage project scope, project time and resourcing.

- Carry out research studies to provide expert judgement on the project progress and strategize contingency and fall-back plans to ensure project deliverables are met as planned.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	10%	
Research Study	Formative	10%	
Assignment	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as "hurdle", students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Joseph Phillips, IT Project Management: On Track from Start to Finish, 3rd Edition, McGraw Hill, 2010.

Reference Book(s):

IEEE Guide--Adoption of the Project Management Institute (PMI(R)) Standard A Guide to the Project Management Body of Knowledge (PMBOK(R) Guide)-Fourth Edition

A Guide to the Project Management Body of Knowledge, copyright page, edition 2 ISBN 1-880410-12-5, and edition 3 2004 ISBN 978-1-930699-45-8, and edition 4 2008 ISBN 1-933890-51-7

A Guide to the Project Management Body of Knowledge, 5th Ed.

Pinto, Jeffrey K. Project management: achieving competitive advantage. Pearson/Prentice Hall, 2007.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Martinsuo, Miia. "Project portfolio management in practice and in context." International Journal of Project Management 31.6 (2013): 794-803.

Dybå, Tore, Torgeir Dingsøyr, and Nils Brede Moe. "Agile project management." Software project management in a changing world. Springer Berlin Heidelberg, 2014. 277-300.

Cagliano, Anna Corinna, Sabrina Grimaldi, and Carlo Rafele. "Choosing project risk management techniques. A theoretical framework." Journal of Risk Research 18.2 (2015): 232-248.

6) MITS5002: Software Engineering Methodology

UNIT DESCRIPTION:

This unit provides the concepts and methodologies required for the construction of software solutions. It discusses the nature, categories and the different software life cycle models used in contemporary software engineering. Key emphasis is placed on systematic approaches that would ensure robust, reusable and secure software solutions that would be scalable and maintainable. The unit elaborates various aspects of software engineering such as requirements engineering, formal specification, validation, design, construction and verification. This unit delves into the processes of both object-oriented analysis and object-oriented design using UML as the notation language.

Students will be able to independently apply the principles and practice of requirements, analysis, design and implementation in software engineering. Students will able to critically analyse customer requirements and implement solution using mature software engineering practices and body of knowledge. Students will be able apply various SE Methodology taught in the unit to situations described in various case studies which will develop their analytical, critical thinking and modelling skills. In addition, students would be able to research into recent methodology proposed by industry and academic experts in the field.

Pre-requisites:
MITS4002
Students who have equivalent knowledge of the prerequisite units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:
Nil

Alternates / Equivalence:
Students are permitted to substitute this unit with MITS5508 unit to meet the core unit requirement.

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 5

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment

expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Software Engineering Methodologies**:
  - Key phases of software development such as requirements gathering; functional, structural and behavioural modelling; system design; and system implementation (referred to as SADT in short).
  - Understanding the organizations, people and systems.
  - Software costs structure and software engineering methods introduction.
- **Requirement Engineering**:
  - Techniques used in requirements gathering.
  - Formal specification of functional and non-functional requirements.
  - Requirement and traceability maintenance.
- **Software Modelling and Architecture**
  - Specification in the software process: formal, sub-system, behavioural specification.
  - Processes for planning and controlling software development.
  - Fundamentals of modelling and software architecture.
  - Types of models: behavioural modelling, data modelling and object modelling.
  - Unified Modelling Language (UML) and CASE workbenches for system modelling.
  - Architectural types: Distributed systems architecture, Enterprise systems architecture, Multiprocessor architectures and Client-server architectures.
- **Software Design**:
  - Modularity principles and specifying software design with activity diagrams
  - Evaluating and selecting alternatives in product design
  - Design using object diagrams, use cases, sequence charts and conceptual modelling
- **Software Development & Testing**
  - Programming process, standards, procedures and guidelines
  - Documentation
  - Software faults and failures
  - Test planning, test case design and test automation

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Understand, critically analyse and choose appropriate methodology for building a software based on the business requirements and technical platform using which the software is distributed.
- Reflect on given project conditions to implement component driven development practices taking into consideration customer requirements, platform features and technological constraints.
- Engineer requirements, design a system or component or process to meet desired business needs within realistic constraints.
- Independently create a system design using the latest engineering tools to devise a robust structural organization and dynamic behaviour using modelling techniques such as class, object, and sequence diagrams.
- Conduct research on state of art practices and assess various modelling methodologies in software architecture, design, development and testing; and recommend appropriate approaches to tie the stages of software engineering methodologies to resources within the project.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	10%	
Research Study	Formative	10%	
Assignment	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or above. In addition, where an assessment component is marked as "hurdle", students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Pressman, Roger S. Bruce R Maxim, Software engineering: a practitioner's approach. Mc Graw Hill, 2013.

Fowler, Martin. UML distilled: a brief guide to the standard object modelling language. Addison-Wesley Professional, 2004.

Reference Book(s):

McConnell, Steve. Code complete. Pearson Education, 2004.

Martin, Robert C. Clean Coder. mitp Verlags GmbH & Co. KG, 2014.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Ebert, Christof, Marco Kuhrmann, and Rafael Prikladnicki. "Global software engineering: An industry perspective." IEEE Software 33.1 (2016): 105-108.

Metzger, Andreas, and Klaus Pohl. "Software product line engineering and variability management: achievements and challenges." Proceedings of the on Future of Software Engineering. ACM, 2014.

Kitchenham, Barbara, and Pearl Brereton. "A systematic review of systematic review process research in software engineering." Information and software technology 55.12 (2013): 2049-2075.

7) MITS5003: Wireless Networks and Communication

UNIT DESCRIPTION:

This unit will introduce students to the advanced theory pertaining to wireless propagation environment and wireless communication systems. It covers planning, architecture, protocols and design of small to large-size WLANs, including installing, configuring, operating, and troubleshooting operations. The unit further discusses cellular systems including their multiple access and interference management issues. The course will focus is on the design, the analysis, and the fundamental limits of wireless transmission systems and capacity of wireless channels. The course also explores multi-user capacity and opportunistic communication paradigms.

Students will be able to describe the advanced technical details of wireless communication systems. Through the hands-on cases dealt in the unit, students would be able to design, install troubleshoot wireless network systems. Students will be able to independently research on recent technology trends to design and develop mobility-aware systems using wireless cellular channels.

Pre-requisites:
MITS4004
Students who have equivalent knowledge of the prerequisite units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 5

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 8 hours / Week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Introduction to Wireless Networking:** Introduction to wireless communication, transmission, fading, interference, data encoding, digital data communication techniques, asynchronous and synchronous transmission, error detection and correction codes.

- **Mobile Networking Fundamentals:** Multiple access techniques: frequency division multiple access (FDMA), time division multiple access (TDMA), code division multiple access (CDMA), space division multiple access (SDMA); Space-time processing: multiple antenna techniques, diversity and multiplexing gains, multiple-input multiple-output (MIMO) systems.
- **Mobile Radio channels:** Path loss, large-scale fading, small-scale fading; Power budge of mobile links; Doppler spread and coherent time, delay spread and coherent bandwidth; flat fading and frequency selective fading.
- **Bluetooth, WiMAX & Wi-Fi**: Overview. Radio Specifications, Baseband Specification, Link Manager Specification, Logical Link Control and Adaptation Protocol.
- **802.11 Wireless LANs:** Introduction to wireless local area networks (802.11). Defining the features of the 802.11 wireless LAN standard, configuring the components and securing of the wireless LAN.
- **Wireless systems and standards:** AMPS, IS-136, GSM, IS-95, WCDMA

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Critically analyse and characterize various mobile wireless channels, and the limitations imposed on communication systems.
- Understand and use the wireless modulation and transmission techniques, and practical channel coding schemes.
- Independently devise the architectures of mobile communications, and recent standard mobile systems, such as the MIMO, 4G networks etc.
- Explore practical situations, conduct survey researches and apply advanced tools to scientifically analyse the performance of trunked radio systems to describe different types of diversity and provide solutions to improve performance for mobile radio channels.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Tutorial Exercises	Formative	10%	
Practical Exercises	Formative	10%	
Assignment (research + course work based)	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or above. In addition, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Cory Beard and William Stallings, Wireless Communication Networks and Systems, Prentice Hall, First edition, 2015.

Reference Book(s):

T. Rappaport, Wireless Communications, Principles ad Practice, 2nd Edition, Prentice Hall, 2002.

David Tse and Pramod Viswanath, Fundamentals of Wireless Communication, Cambridge University Press, 2005.

Vijay Garg, Morgan Kaufmann, Wireless Communications & Networking, Morgan Kaufmann, 2007

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Bastug, Ejder, Mehdi Bennis, and Mérouane Debbah. "Living on the edge: The role of proactive caching in 5G wireless networks." IEEE Communications Magazine 52.8 (2014): 82-89.

Gunduz, Deniz, et al. "Designing intelligent energy harvesting communication systems." IEEE Communications Magazine 52.1 (2014): 210-216.

Ju, Hyungsik, and Rui Zhang. "Throughput maximization in wireless powered communication networks." IEEE Transactions on Wireless Communications 13.1 (2014): 418-428.

8) MITS5004: IT Security

UNIT DESCRIPTION:

This unit will provide an in-depth understanding of major IT security issues, technologies and approaches. The unit covers wide range of security topics such as IT security foundations, cryptography, network security and software security. The unit explains how to apply knowledge of security properties, concerns, policies, models, cryptography, PKI, firewalls and security evaluation on real-life security case studies.

Students will be able to critically evaluate vulnerability, detect & reduce threats, and will be prepared to chart out the authentication / encryption needs of organizations so as to establish plans for risk management. Students will learn to implement security measures using selected security technologies taught in the unit and be able research various security models to evolve strategies and implement changes in the dynamically mutating security threats with reference to ISO 27001.

Pre-requisites:
Nil

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 5

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Foundations of Security**:
    - Essential IT security concepts

- Principles of IT security, vulnerabilities, protections, malware, program analysis and policies (security policies, confidentiality policies, integrity policies and hybrid policies).
- Security Analysis of hardware, software, components of a network and the interrelations.

- **Cryptography**:
  - Practical cryptography using encryption, authentication and hashing.
  - Fundamentals of symmetric and asymmetric cryptography.
  - Block and stream ciphers, cryptographic hash functions and message authentication codes.
  - Creating and managing public/private key for message digests.
  - Calculating approximate strength of ciphers, authentication and password systems.
- **System and network security**:
  - Secure design principles (Least-privilege, fail-safe defaults, complete mediation, separation of privilege)
  - Secured kernel construction and defence against memory exploits.
  - Operating system security.
  - TCP/IP security issues and DNS security issues.
  - Network intrusion detection and prevention systems, Introduction to firewalls.
- **Software and application security**:
  - Vulnerability auditing, sandboxing and control flow integrity.
  - User authentication, authentication-via-secret and session management.
  - Cross site scripting, cross site request forgery and SQL Injection.
  - Diverse ways in which information can be communicated, and awareness of security implications for each method of communication.
  - Concepts of confidentiality, availability and integrity in information assurance, including physical, software, devices, policies and people.
- Information security management system (ISMS) framework
  - Policies and procedures
  - Risk management processes
  - Legal, physical and technical control measures.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Identify IT infrastructure components and the roles they serve, and design security models for these infrastructure components such as devices, topologies, protocols, systems software, management and security.
- Critically evaluate different cryptographic techniques and apply the most appropriate security solution that would preserve integrity, confidentiality and authenticity for a given context.
- Independently implement solutions for networking and security problems, balancing business concerns, technical issues and security by incorporating emerging technologies such as ossim, wireshark etc.
- Use appropriate resources and techniques to critically analyse the security threats on existing software systems and carry out in-depth research on evolving techniques to applying to future situations.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	10%	
Research Study	Formative	10%	
Assignment	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as "hurdle", students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

William Stallings and Lawrie Brown, Computer Security: Principles and Practice, 3rd Edition, 2015

Reference Book(s):

Pfleeger, Charles P., and Shari Lawrence, Security in computing. Prentice Hall Professional Technical Reference, 2015

Mark Rhodes-Ousley, Information Security: The Complete Reference, Second Edition, 2013.

Mao, Wenbo. Modern cryptography: theory and practice. Prentice Hall Professional Technical Reference, 2003.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Crossler, R. E., Johnston, A. C., Lowry, P. B., Hu, Q., Warkentin, M., & Baskerville, R. "Future directions for behavioural information security research." Computers & security, 32, (2013): 90-101.

Almorsy, Mohamed, John Grundy, and Ingo Müller. "An analysis of the cloud computing security problem." arXiv preprint arXiv:1609.01107 (2016).

Romer, Hormazd. "Best practices for BYOD security." Computer Fraud & Security 2014.1 (2014): 13-15.

9) MITS5501: Software Quality, Change Management and Testing

UNIT DESCRIPTION:

This unit provides the necessary theory and practices for effective implementation of a software quality assurance program. It provides the methods and tools for quality assurance and testing for each stage of the software development lifecycle. Software quality management concepts such as total quality management, quality plan and required documentation are discussed. The unit elaborates on the validation and verification practices such as peer review, software testing activities, use case design, test case design and test coverage criteria. The unit also elaborates on improving quality through software configuration management activities such as library process, configuration items identification, baselines, control, versioning, reporting and audits.

Students will be prepared to apply the principles of total software quality management and be able to implement software quality assurance, quality measures, and quality control in practical contexts using realistic case studies. Students will be able to effectively identify and organize configuration items to be controlled with configuration management, including labelling and version control which are important from software maintenance and future evolution. Students will be able to use their expert knowledge gained from the unit as well as through research assignments to devise test strategy and create test plans, design test cases and execute testing activities.

Pre-requisites:
MITS4002
Students who have equivalent knowledge of the prerequisite units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 5

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study, which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment

expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Introduction to Software Quality Engineering**:
  - Principles and key concepts behind software quality engineering and process improvements.
  - Importance of process improvement's influence in an organization's performance.
  - Software quality frameworks and models such as CMMIR and Capability Maturity Model (Integrated).
- **Software Quality Management Systems**:
  - Introduction to SQMS and ISO9001:2000.
  - Key processes related to quality management system such as pre-assessment, system design, implementation of quality system framework and monitoring activities.
  - Quality manual development, life cycle activities and supporting activities.
  - QMS engagements such as assessments, audits and reviews.
- **Peer Reviews:**
  - Peer review rules, source documents and kin; the software inspection process;
  - Strategies and methods involved in performing peer reviews.
  - Inspection roles and responsibilities;
  - Defect classifications, defect logging and peer review follow-up.
- **Software Testing**:
  - Testing as an effective validation and verification process
  - Purpose of testing; functional and quality testing;
  - Testing techniques; test case design;
  - Tool based testing; success criteria; defect tracking and defect cause analysis.
- **Software Configuration Management:**
  - Configuration Identification, Configuration Control, Baseline
  - Status Accounting
  - CM Audits to establish and maintain the integrity of the project's lifecycle work products as well as the final delivered system.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Adopt specialised quality engineering and assurance procedures to improve the implementation quality and efficiency of software engineering projects using the advanced concepts and principles learnt throughout the unit.
- Independently develop clearly defined internal quality management approaches by addressing the quality factors and risks that may affect the resulting software development.
- Evolve peer review process using tools and technique taught in the unit as well as carry out research on emerging techniques published in literature to further improve the peer review communication process.
- Conduct research on alternate approaches reported in literature with regard to software testing and use the expert knowledge attained in the unit to select optimal tools for different situations in an IT project.

- Prepare configuration plan for a software project to include sections on change management, configuration management and labelling with version control.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	10%	
Research Study	Formative	10%	
Assignment	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as "hurdle", students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

William E. Lewis, Software Testing and Continuous Quality Improvement, Third Edition, CRC Press, 2016

Reference Book(s):

Sanders, Joc, and Eugene Curran. Software quality: a framework for success in software development and support. Pearson, 1994.

Jalote, Pankaj. CMM in practice: processes for executing software projects at Infosys. Addison-Wesley Professional, 2000.

Jones, Capers, and Olivier Bonsignour. The economics of software quality. Addison-Wesley Professional, 2011.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Orso, Alessandro, and Gregg Rothermel. "Software testing: a research travelogue (2000–2014)." Proceedings of the on Future of Software Engineering. ACM, 2014.

De Lemos, Rogério, et al. "Software engineering for self-adaptive systems: A second research roadmap." Software Engineering for Self-Adaptive Systems II. Springer Berlin Heidelberg, 2013. 1-32.

Fitzgerald, Brian, and Klaas-Jan Stol. "Continuous software engineering and beyond: trends and challenges." Proceedings of the 1st International Workshop on Rapid Continuous Software Engineering. ACM, 2014.

10) MITS5502: Developing Enterprise Systems

UNIT DESCRIPTION:

The unit provides the knowledge and skills required to design and develop enterprise systems using state-of-the-art computing principles and practices. The unit teaches important software engineering patterns with an emphasis on the critical analysis of their applicability to large enterprise systems using popular development platform such as Java or .NET at the server side and complemented with client side scripting tools such as PHP, JavaScript or mobile apps. By exploring the various challenges in real-life enterprise situations and business process perspectives, the unit would prepare students to devise novel approaches of problem solving for implementing reusable software components.

Students would get equipped to use best design principles for enterprise grade software systems. Students will able to apply these principles to implement a well-engineered web-based, component-oriented application on the chosen enterprise platform. Students would be trained to study industry white papers and practice based research article to understand emerging enterprise design patterns and adopt them in their projects and assignments.

Pre-requisites:
MITS4002, MITS4003, MITS5002
Students who have equivalent knowledge of these units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 5

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Overview of Enterprise Systems**:
    - Components of enterprise systems.
    - Building an enterprise system from a business process perspective.
    - Evaluate the use of enterprise technologies, frameworks and platforms.
    - Understand the features, strength and weaknesses of various enterprise implementation platforms available.
    - Analyse and choose suitable enterprise platform for implementation.
- **Business Layer Design & Implementation**:
    - Identify business components based on the business process of user requirements.
    - Implement best practices and necessary design patterns such as domain model pattern, transaction script pattern and table module pattern.
    - Understand and design business components with enterprise concerns such as transactions, scalability, concurrency and security.
    - Securing the enterprise system business components.
- **Presentation Layer Design & Implementation**:
    - Presentation framework and components to structure a web application
    - Implementing a request-based or component-based architecture to automate form handling, session and state management,
    - View-templates, cross cutting presentation components, client side validation
    - AJAX for responsive web components and enhance maintainability.
    - Presentation patterns such as Model-View-Controller, Model-View-Presenter, Presentation-Model and Dual Model-View-Controller.
- **Data Access Layer Design & Implementation**:
    - Enterprise data structure concepts including various file access and management systems.
    - Architectural concepts used in persistence layer including transaction processing, business objects, relationships, associations, enterprise messaging and queues.
    - Key design concepts & patterns, such as contract of data access layer, plug-in patterns, O-R mapping framework.
    - Implementation practices regarding persistence layer and query services.
    - O-R design issues such as transactional semantics, concurrency handling, lazy loading, persistent state management and related best practices.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Apply best practices to design application components and business objects by analysing the business needs and adopting software engineering best practices.
- Structure Web Tier & Application Components by identifying the most appropriate structural pattern.
- Implement data access/persistence mechanisms including implementing enterprise-grade transactions in traditional as well as non-SQL data environments.
- Carry out research on emerging tools and use expert knowledge gained to choose the right developmental strategy and tools to implement enterprise solutions without compromising prudent design principles.
- Synthesise complex enterprise business and operational needs to develop robust, reliable and secure applications in a chosen implementation platform such as spring, jedf etc.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Research Study	Formative	10%	
Project	Summative	40%	Yes
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

A book on developing enterprise systems using Java or .NET or an emerging enterprise platform would be recommended based on the chosen platform used in the unit.

Reference Book(s):

Fedorov, Alex. Programmer's Guide to. Net. Addison-Wesley Longman Publishing Co., Inc., 2002.

Goncalves, Antonio. Beginning Java EE 6 with GlassFish 3. Apress, 2010.

Stiefel, Michael, and Robert J. Oberg. Application development using C# and. Net. Prentice Hall Professional, 2002.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Weichhart, Georg, et al. "Challenges and current developments for sensing, smart and sustainable enterprise systems." Computers in Industry 79 (2016): 34-46.

Panetto, Hervé, et al. "New perspectives for the future interoperable enterprise systems." Computers in Industry 79 (2016): 47-63.

Dorantes, Carlos-Alberto, et al. "The effect of enterprise systems implementation on the firm information environment." Contemporary Accounting Research 30.4 (2013): 1427-1461.

11) MITS5503: Mobile Computing

UNIT DESCRIPTION:

This unit provides key mobile computing knowledge from three perspectives: mobile technology, application development, and user interaction. The unit introduces various mobile technologies and wireless communication and subsequently details on common paradigms in mobile application development such as low power computing, computing in an environment with limited resources, fault tolerance, effective user interfaces and persistence. In addition, the unit teaches implementation details of software development using one popular mobile platform as such as Android or iOS.

Students will learn the mobile computing principles and acquire hands-on experience with mobile computing systems. Students apply their knowledge and skills to design and develop commercial grade mobility-aware applications. Using the knowledge and skills delivered in the unit as well as through their further research in the fast passed mobile computing platforms, students would have the expertise to build maintainable and architecturally sound mobile system on a chosen implementation platform.

Pre-requisites:
MITS4002, MITS4003, MITS4004
Students who have equivalent knowledge of these units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 5

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Overview of Mobile Computing**
    - Mobile Computing Models
    - Anatomy of a mobile device
    - Survey of Mobile Devices
    - Service Discovery Protocols
    - Location Based Services
    - Mobile Networking and Cellular networks
    - Geolocation and Global Positioning System (GPS)
- **Mobile Development Platform**:
    - Introduction to Mobile Wireless Services.
    - Programming principles and practices focusing on mobile environment
    - Compare, Contrast and choose an implementation platform from Android or iOS or Windows
        - Underlying OS (Darwin vs. Linux vs. Win 8) kernel structure
        - Native level programming
        - Runtime environment.
    - Design and develop application using the chosen platform
    - User interface, mobile-specific technologies, networking protocol and the additional hardware peripherals
    - User constraints (application interruption, responsiveness, partial user engagement)
    - Device constraints (power consumption, screen size, network connectivity, memory limitations)
- **Application Environment, Navigation and Event Management**:
    - Understanding the underlying Software Development Kit (SDK
    - Using the language compilers and application programming interfaces
    - Multiple views, screen layout, navigation, delegation, orientation, Model-View-Controller (MVC) paradigm and default application settings.
- **The User Experience**
    - The Small Screen Problem
    - The Unified Look and Feel Paradigm
    - Common User Interface Guidelines
    - Design and development of user interface components, collections and utilities.
    - Handling user events and their respective interaction
- **Memory Management, Devices, Navigation and Networking**:
    - APIs related to network access, phone, contact book and similar low level OS support features.
    - Battery and power management.
    - Different communication protocols
    - Device management such as gestures, GPS, accelerometer, Camera, gyroscopes and multi-touch interfaces.
    - Security issues
    - Maps, location sensitivity and navigation.
- **Data Management**:
    - File system, property lists, database persistence using mini-database
    - Handling special data such as streaming video and audio.

- Managing consistency, reliability and state between application invocations.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Reflect on the business needs and systematically organize the functionalities and components of mobile computing systems into different layers and apply various techniques for realizing the functionalities.
- Develop mobile computing applications by critically analysing their characteristics and requirements, selecting the appropriate computing models and software architectures.
- Carry out research on the fast evolving mobile technologies to evaluate various implementation platforms' suitability for given mobile application context.
- Design an effective user interface and service layer for wireless application using the chosen implementation platform.
- Implement an end to end mobility based solution using the chosen implementation platform using tools such as android sdk, swift or other emerging app developer tools.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Practical Exercises	Formative	10%	
Research Study	Formative	10%	
Project	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. Further, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Kumkum Garg, Mobile Computing: Theory and Practice, Pearson Education, 2010

Reference Book(s):

Schiller, Jochen H. Mobile communications. Pearson Education, 2003

Elliott, Geoffrey, and Nigel Phillips. Mobile commerce and wireless computing systems. Pearson/Addison Wesley, 2004.

Banga, Cameron, and Josh Weinhold. Essential Mobile Interaction Design: Perfecting Interface Design in Mobile Apps. Pearson Education, 2014.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Edmondson, James, et al. "Next-generation mobile computing." IEEE Software 31.2 (2014): 44-47.

Beck, Michael Till, et al. "Mobile edge computing: A taxonomy." Proc. of the Sixth International Conference on Advances in Future Internet. 2014.

Lamsfus, Carlos, et al. "Going mobile: Defining context for on-the-go travelers." Journal of Travel Research 54.6 (2015): 691-701.

12) MITS5504: Interaction Design and Usability

UNIT DESCRIPTION:

The unit discusses human-machine interaction components and covers essential design thinking practices to enhance the user experience. It provides an in depth coverage on the methods, concepts and techniques necessary to make user experience design an integral part of developing information interfaces. The unit takes an inter-disciplinary approach drawing upon product design, information architecture, cognitive psychology and prototyping to design an effective user interface design keeping in view the business benefits and requirements.

Students will be able to use group ideation techniques, sketches and software tools to come up with prototypes and interaction design model for the system under study. Students will be able to independently define user-centric interactions, describe user interfaces, test and evaluate the defined interfaces for factors such as usability and sustainability in several practical contexts over time. Since the field is constantly mutating with new requirements due to evolving of user facing technologies, students would be adequately prepared through assignments to research on the latest practices and adopt them in their usability design.

Pre-requisites:
MITS4001
Students who have equivalent knowledge of the prerequisite units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 5

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Introduction to Interaction Design**:
    - Introduction to interaction design and its relation to human-computer interaction.
    - Conceptualising different forms of interaction, cognitive aspects of design, social aspects of design and emotional aspects of interaction design.
- **User Experience and Design Thinking**:
    - Critical issues and theoretical underpinnings of User eXperience (UX) design;
    - Principles of user experience design and conducting market research and analysis.
    - Establishing requirements for interface design concepts using techniques such as persona development, task description, and use cases.
    - Design thinking as an approach to decision making process, influence of design thinking in people, process and tool involved in interaction design.
- **Data Gathering and Interfaces Development**:
    - Types of user interfaces and interaction design types.
    - Data gathering techniques such as information mapping, information visualization, collaborative communication, and affect aspects.
    - Development topics include conduct user research, gather user requirements, profile user personas and craft a structure for information architecture.
    - Creating mental models, wireframes and draft design using prototyping techniques.
    - Construction of user experience design artefacts using flow diagrams, wire-framing, and paper prototypes.
- **Design Evaluation and Testing**:
    - Design evaluation, reviewing design language and usability testing.
    - Evaluation of alternatives for design concepts using techniques such as competitive analysis, scenario-based design, and story-boarding;
    - Applying feedback from evaluations to improve information interfaces through a process of iterative, user-centred design.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Critically analyse diverse application contexts to define user-centric interactions, describe user interfaces, test and evaluate the defined interfaces for factors such as usability and sustainability.
- Apply iterative cycles of research, data gathering techniques and development based on the understanding of user needs, goals and experiences.
- Demonstrate high degree of competency in information architecture, human-computer interaction and interface design.
- Synthesise business information to build and test rapid prototypes for look and feel and usability.
- Carry out research on various user experience design models, evaluate these and design artefacts using techniques such as representative user testing, inspection methods, and expert analysis.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	20%	
Research Study	Formative	10%	
Assignment	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as "hurdle", students are required to achieve at least 40% in those hurdle components in addition to an overall mark of at least 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Preece, Jenny, Helen Sharp, and Yvonne Rogers. *Interaction Design-beyond human-computer interaction*. John Wiley & Sons, 2015.

Reference Book(s):

Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation by Tim Brown, Harper Business (September 29, 2009).

Jones, Matt, and Gary Marsden. "Mobile interaction design." (2006), Wiley 2006 Edition.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Vallgårda, Anna. "Giving form to computational things: developing a practice of interaction design." Personal and Ubiquitous Computing 18.3 (2014): 577-592.

North, Steve, and Clara Mancini. "Introduction." interactions 23.4 (2016): 34-36.

Guha, Mona Leigh, Allison Druin, and Jerry Alan Fails. "Cooperative Inquiry revisited: Reflections of the past and guidelines for the future of intergenerational co-design." International Journal of Child-Computer Interaction 1.1 (2013): 14-23.

13) MITS5505: Knowledge Management

UNIT DESCRIPTION:

This unit describes in detail the various knowledge management strategies and the driving forces behind them. The unit discusses the key elements of data, information, tacit and factual knowledge using SECI knowledge creation model. The unit elaborates various KM solutions and details how to appraise suitability of these solutions. The unit provides practice based knowledge by discussing the essential practices in developing a knowledge management framework through industry case studies. The unit finally discusses various factors influencing the knowledge management solutions.

Students will be prepared to put in practice the knowledge management techniques to meet organisational goals such as improved performance, competitive advantage, innovation, integration and continuous improvement of the organisation. Applying the knowledge attained in the unit as well as through research assignments of the unit, students will be able to create a sustainable knowledge management framework, processes and procedures, tools and techniques that essentially taps on the above-mentioned organizational objectives

Pre-requisites:
MITS4001, MITS4003
Students who have equivalent knowledge of the prerequisite units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 5

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study, which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Introduction to Knowledge Management (KM)**:
    - Understanding Data, Information and Knowledge.
    - The key stages in knowledge management system life cycle.
    - Key driving factors in knowledge management and the SECI model of knowledge creation.
    - Infrastructure requirements for KM solutions.
- **Knowledge Management Process**:
    - Mechanisms and technologies for knowledge capture, storage, discovery, sharing and application of knowledge.
    - Evaluation and usage of expert knowledge.
    - Capturing tacit knowledge using knowledge capturing techniques such as brain storming, protocol analysis, consensus decision making, repertory grid, concept mapping and black boarding.
- **Knowledge Management Frameworks**:
    - Introduction to KM framework.
    - Create a Knowledge Management team.
    - Identify the business problem/needs & justify KM.
    - Perform the Knowledge Management assessment & audit. Perform an IT assessment.
    - Develop a KM Strategy and Plan. Implement the KM solution.
- **Factors influencing KM Solutions**:
    - Contingency factors influencing KM solutions such as task characteristics, knowledge characteristics, organizational characteristics, environmental characteristics.
    - Ethical, legal, and managerial issues in knowledge management solutions.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Understand, create and use knowledge management solutions that contribute towards cost savings and improved productivity of an organization.
- Appraise how and why knowledge management solutions might have different performance impacts, depending on the circumstances by evaluating the key factors and their nature of impact on performance.
- Conduct research on emerging tools and techniques for the stages of knowledge creation, acquisition, transfer and management of knowledge and recommend the most appropriate choice based on expert judgement on the practical needs.
- Apply and integrate appropriate KM components to develop effective knowledge management solutions.
- Independently design a usable knowledge management strategy by application of key elements of a good knowledge management framework and by incorporating industry best practices and state of the art tools such as OpenKM or other emerging technologies.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	20%	
Assignment (course + research)	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as "hurdle", students are required to achieve at least 40% in those hurdle components in addition to an overall mark of at least 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Knowledge Management, By Elias M. Awad, Hassan M. Ghaziri, Prentice Hall, Second Edition, 2010.

Reference Book(s):

Foo, Schubert, Ravi Sharma, and Alton Chua. Knowledge management: tools and techniques. Pearson/Prentice Hall, 2007.

Dalkir, Kimiz. Knowledge management in theory and practice. Routledge, 2013

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Becerra-Fernandez, Irma, and Rajiv Sabherwal. Knowledge management. Routledge,, 2015.

Barnes, Stephanie, and Nick J. Milton. Designing a successful KM strategy: A guide for the knowledge management professional. Information Today, Incorporated, 2015.

Jiménez-Jiménez, Daniel, Micaela Martínez-Costa, and Raquel Sanz-Valle. "Knowledge management practices for innovation: a multinational corporation's perspective." Journal of Knowledge Management 18.5 (2014): 905-918.

14) MITS5506: Enterprise Application Integration

UNIT DESCRIPTION:

The unit establishes the need for enterprise integration as an essential part of enterprise collaboration. The unit examines a range of advanced concepts and technologies for enabling application integration in diverse distributed IT environments. The unit discusses relevant methodology for architecting integration solutions. The unit explains possible architectural options for a variety of design scenarios, and assess their relative advantages and disadvantages to determine the suitability of a given business scenario. An in depth coverage of Service Oriented Architecture as a means for enterprise wide integration is provided.

Students will gain advanced knowledge on a wide range of technologies that are used to meet the integration needs of an organization. Students will be prepared to research on several alternate integration models and patterns and use the most appropriate technology or combination of technologies to provide solutions to specific integration needs of an enterprise.

Pre-requisites:
MITS4004, MITS5002 / MITS5508, MITS5003
Students who have equivalent knowledge of these units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 5

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study, which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Enterprise Application Integration (EAI)**:
    - Requirements for enterprise application integration.
    - Challenges, needs and risks in enterprise application integration.
    - Types of integration including integration with legacy systems, integration with partners and integration with other heterogeneous environments.
    - EAI implementation technologies such as web services, messaging, ETL, direct data integration and middleware.
- **Message Oriented Middleware**:
    - Types of Messaging such as synchronous and asynchronous messaging.
    - Structure of messages.
    - Publishing, broadcasting, multicasting, topics and queues.
    - Challenges to be addressed by messaging architecture such as reliability, security and robustness.
    - Infrastructure needs to support messaging architecture.
    - Example case study and demonstrations using Java or .Net platform messaging services or Products such as Tibco, BizTalk or Websphere.
- **Approaches and Patterns**:
    - Challenges in EAI such as performance, security and reliability through case studies.
    - Major architectural approaches such as services oriented architecture and messaging architecture.
    - Introduction to integration patterns.
    - Pattern discussion such as point to point, broker, message bus and publish/subscribe.
- **Service Oriented Architecture (SOA)**:
    - Motivations for integrating business processes using SOA.
    - SOA principles such as service invocation, reuse, virtualisation and brokering.
    - Progressing from conceptual to buildable services, structuring business requirements into an SOA, aligning services with the organization.
    - Service reference model and SOA reference architecture.
    - Value propositions of SOA. Design and refining of service including recognizing opportunities, defining the domain, crafting atomic services and consolidating composite services.
    - Maturity models, service lifecycle governance and benefits of SOA.
    - Identifying and designing services.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Critically analyse technology building blocks of an enterprise integration solution and execute a methodical approach to independently develop a technical architecture for automating a given business process.
- Technically assess different e-Business architecture patterns when developing an enterprise integration solution.
- Apply best practices to analyse and design service using SOA from both business and IT perspectives.
- Carry out research on recent SOA & Integration methodologies, technologies and standards and adapt these to expertly implement enterprise wide, integrated, service based solutions.
- Build integrated systems using various information representations using message oriented middleware such as publishing, topics, queues and web services.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	10%	
Research Study	Formative	10%	
Project	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as "hurdle", students are required to achieve at least 40% in those hurdle components in addition to an overall mark of at least 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Gold-Bernstein, Beth, and William Ruh. Enterprise integration: the essential guide to integration solutions. Addison Wesley Longman Publishing Co., Inc., 2004.

Waseem Roshen, SOA-Based Enterprise Integration: A Step-by-Step Guide to Services-based Application, McGraw Hill,2009

Reference Book(s):

Hohpe, Gregor, and Bobby Woolf. Enterprise integration patterns: Designing, building, and deploying messaging solutions. Addison-Wesley Professional, 2004.

Bieberstein, Norbert, et al. Executing SOA: a practical guide for the service-oriented architect. Addison-Wesley Professional, 2008.

Erl, Thomas. Service-oriented architecture: concepts, technology, and design. Pearson Education India, 2006.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for

assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Panetto, Hervé, and Joe Cecil. "Information systems for enterprise integration, interoperability and networking: theory and applications." (2013): 1-6.

Zimmermann, Olaf, et al. "A decade of enterprise integration patterns: A conversation with the authors." IEEE Software 33.1 (2016): 13-19.

Serrano, Nicolas, Josune Hernantes, and Gorka Gallardo. "Service-oriented architecture and legacy systems." IEEE software 31.5 (2014): 15-19.

15) MITS5507: Business Process Modelling & Management

UNIT DESCRIPTION:

The unit provides comprehensive coverage related to analysing and modelling of business processes. The unit introduces frameworks for understanding the design, control and improvement of business processes. Implementation details are discussed using modelling tools and analytical frameworks. Case studies are used to reinforce the general principles for managing business processes, illustrate topics such as identification of information-bearing events and to understand how to assess and improve process efficiency. It also discusses the interactions between human behaviour and process design.

Students would be prepared to critically analyse and define business process using industry standard business process notations and use it as building block to develop IT solutions that meets the business operation in an optimal way. Applying their knowledge gained in the unit and incorporating research ideas gained through their research assignments, students will become proficient in enhancing an existing process and designing new processes using the business process life cycle over time.

Pre-requisites:
MITS4001, MITS5001, MITS5002 / MITS5508
Students who have equivalent knowledge of the prerequisite units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 5

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study, which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Introduction to Business Processes**:
    - Processes & information.
    - Conceptualization of business activities as processes that need information.
    - Apply Operations Management concepts to analyse and assess business processes using established performance metrics.
    - Current and emerging information technologies and architectures as enablers of business process improvement, integration and automation.
- **Business Process Modelling**:
    - Model business processes in terms of people, and activity sequences involved, the data and materials flowing through those sequences and the dependencies between business information and operational activities.
    - Document and model operational business processes by means of event and information flow models. Construct visual process models using methods such as UML activity diagrams or data flow diagrams or popular BPMN.
- **Business Process Management**:
    - Assess the documented business processes using their key operations characteristics; *e.g.*, efficiency, intended service quality, process flexibility and costs associated with delays, material low volume and level of service or product customization.
    - Relate the characteristics of a business process with the process' behaviour through simulation.
- **Business Process Improvement**:
    - Use basic operations concepts such as lean manufacturing and total quality management (TQM) to improve the efficiency and effectiveness of existing processes.
    - Diagnose problems and formulate improvements to observed processes and estimate the effects of these improvements in terms of the process metrics.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Critically analyse complex business workflows and demonstrate the relationships between business processes, strategy and organizational performance.
- Carry out research on emerging practices to recommend ideal resources such as technical components, various process flow measurements and methods for calculating them based on a critical analysis of the requirements for deploying a BPM system.
- Apply scientific approach to diagnose the root causes of poor process performance and recommend appropriate managerial levers for improving them.
- Expertly model, analyse, simulate, and redesign processes to achieve specific performance goals and be able to productively use latest tools for these.
- Define the challenges and opportunities associated with IT-enabled business process automation.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?

Case Studies & Presentation	Formative	5%	
Research Study	Formative	5%	
Project	Summative	40%	Yes
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of at least 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Dumas, Marlon, et al. Fundamentals of business process management. Berlin: Springer, 2013.

Reference Book(s):

Weske, Mathias. Business process management: concepts, languages, architectures. Springer Science & Business Media, 2012.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Goedertier, Stijn, Jan Vanthienen, and Filip Caron. "Declarative business process modelling: principles and modelling languages." Enterprise Information Systems 9.2 (2015): 161-185.

Kopp, Oliver, et al. "The difference between graph-based and block-structured business process modelling languages." Enterprise Modelling and Information Systems Architectures 4.1 (2015): 3-13.

Rosemann, Michael, and Jan vom Brocke. "The six core elements of business process management." Handbook on business process management 1. Springer Berlin Heidelberg, 2015. 105-122.

16) MITS5508: Agile Methodology

UNIT DESCRIPTION:

This unit provides the concepts required for the construction of software solutions using agile methodologies. It discusses the nature, categories and the different software life cycle models used in agile software engineering. The unit elaborates various agile aspects in phases such as requirements engineering, management, design, modelling development, testing and continuous delivery. The unit discusses 'Agile' engineering practices to foster collaboration, feedback, and continuous improvement for producing business value.

Students will be able to independently apply the agile principles and practice of requirements, analysis, and design while implementing software solutions. Students will able to critically analyse customer requirements and implement solution using agile based software engineering practices and body of knowledge. Students will be able apply various recent agile practices learnt in the unit and gained through research assignments to situations described in various case studies which will develop their analytical, critical thinking and modelling skills.

Pre-requisites:
Nil

Prohibitions:
Nil

Equivalence/Alternates:
Students may study this unit in place of MITS5002 and meet the core unit requirement. Students may also opt to study this unit as added knowledge even if they have studied MITS5002.

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 5

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Classic vs Agile Software Engineering Methodologies**:
    - Overview of Software Engineering Methodologies
    - Major phases of development life-cycle
    - Key phases of classic software development such as requirements gathering; functional, structural and behavioural modelling; system design; and system implementation (SADT).
    - Overview of various classic models such as waterfall, iterative model and rational unified process (RUP).
- **Agile Development Lifecycle**
    - Core concepts in rapid application development
    - Choosing plan-driven vs. Agile methodologies
    - Choosing between different types of Agile Methods: XP, Scrum, Lean, Kanban, Feature-Driven, Model-Driven and Test-Driven Developments
    - Prioritization and Sprint Planning, identifying ideal iteration length, agile manifesto, principles and practices
- **Agile Management**:
    - Planning for release, iteration, features and task, prioritizing features and estimating work
    - Estimating business values, effort, organizing features based on business priority and dividing features into tasks.
    - Calculating velocity, tracking using burn down charts and monitoring progress.
    - Processes for planning and controlling software development.
- **Agile Requirement Engineering**:
    - Techniques used in requirements gathering
    - User stories, product back log and technical debt
    - Requirements life-cycle and traceability matrix maintenance.
- **Agile Design and Modelling**:
    - Design Smells
    - Rigidity, fragility, immobility, complexity and flexibility design
    - Modelling using class and sequence diagrams
- **Agile Testing and Development**
    - Test driven development, test isolation and serendipitous architecture
    - programming and refactoring
    - Agile Test planning, test case design and test automation
- **Agile Continuous Delivery**
    - Configuration management and deployment pipeline
    - Build tools and test automation
    - Continuous integration and delivery

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Understand, critically analyse and choose appropriate agile methodology for building a software based on the business requirements and technical platform.
- Reflect on given project conditions to implement agile practices taking into consideration various environment, management, people, and customer perspectives.

- Expertly model, analyse, simulate, and redesign processes to achieve specific performance goals using popular agile management software such as Agilo for Srum or SprintGround.
- Expertly apply design refactoring and test driven development practices to assist the design, test, development and test again phases of agile software development.
- Conduct research on the key elements of project planning, to understand emerging agile modelling approaches and continuous delivery pipelines and apply these to practical agile based development projects.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	10%	
Research Study	Formative	10%	
Assignment	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or above. In addition, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Martin, Robert C. Clean code: a handbook of agile software craftsmanship. Pearson Education, 2009.

Reference Book(s):

Rubin, Kenneth S. *Essential Scrum: A practical guide to the most popular Agile process*. Addison-Wesley, 2012.

Ambler, Scott W., and Mark Lines. Disciplined agile delivery: A practitioner's guide to agile software delivery in the enterprise. IBM Press, 2012.

Pressman, Roger S. Bruce R Maxim, Software engineering: a practitioner's approach. Mc Graw Hill, 2013.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Serrador, Pedro, and Jeffrey K. Pinto. "Does Agile work? —A quantitative analysis of agile project success." International Journal of Project Management 33.5 (2015): 1040-1051.

Losada, Begoña, Maite Urretavizcaya, and Isabel Fernández-Castro. "A guide to agile development of interactive software with a “User Objectives”-driven methodology." Science of Computer Programming 78.11 (2013): 2268-2281.

Matharu, Gurpreet Singh, et al. "Empirical study of agile software development methodologies: A comparative analysis." ACM SIGSOFT Software Engineering Notes 40.1 (2015): 1-6.

17) MITS5509: Intelligent Systems for Analytics

UNIT DESCRIPTION:

This unit provides the students an in-depth understanding of intelligent business systems that can represent, reason about and interpret data. Students would learn about modern day business systems that go beyond traditional data processing by incorporating intelligent features such as: algorithms for learning about the structure of the data, analysing the data to extract patterns and meaning, deriving new information, and suggesting strategies to act on the results of its analysis. This unit prepares the students in understanding the core principles of building Business Intelligence System that solves problems related to data analytics discipline.

Upon completing the unit, students would be able to independently apply ideas and synthesise concepts drawn from the areas of knowledge engineering, intelligence algorithms, decision making, mining and warehousing. Students would be prepared to research on emerging trends a range of fields such as data sciences, linguistics and brain sciences, forming many interdisciplinary relationships.

Pre-requisites:

MITS4001, MITS4002, MITS 5004

Students who have equivalent knowledge of the prerequisite units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:

Nil

Subject weighting

6 credit points

Mode of Delivery & Teaching approach:

Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit

Level 5

Duration

1 Semester

Contact Hours & Workload:

3 Hours of Lecture / Classroom Discussion per week

2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study, which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **An Overview of Business Intelligence, Analytics and Decision Support Systems**:
    - **Introduction** to Intelligence creation, use and governance; Foundations and Technologies for Decision Making; Basics of Business Analytics.
    - **Decision Support Systems:** Characteristics of Decision Making; The Intelligence Phase - The Design Phase - The Choice Phase and The Implementation Phase. The Concept of Decision Support Systems (DSS); An Early Framework - The Gorry and Scott-Morton Classical Framework - Computer Support for Structured Decisions, Unstructured Decisions and Semi-Structured Problems.
    - **Business Intelligence**: Evolution of DSS into Intelligent Systems; Components of Business Intelligent Systems; Architecture of Business Intelligent Systems;
    - **Business Analytics**: Business Analytics Overview; Analytics Applied to Different Domains; Four Types of Analytics - Descriptive Analytics, and Prescriptive Analytics.
- **Descriptive Analytics**
    - **Data Warehousing:** Data Warehousing Definitions and Concepts; Data Warehousing Process Overview; Data Warehousing Architectures; Data Integration and the Extraction, Transformation, and Load (ETL) Processes.
    - **Business Reporting, Visual Analytics, and Business Performance Management:** Business Reporting Definitions and Concepts; Data and Information Visualization; Business Performance Measurement and Management.
- **Predictive Analytics**
    - **Data Mining:** Data Mining Concepts and Applications; Data Mining Process; Data Mining Methods and Software Tools; and Data Mining Methods.
    - **Techniques for Predictive Modelling**: Neural Network Architectures; Support Vector Machines; Nearest Neighbour Method for Prediction and Sample Predictive Applications.
- **Prescriptive Analytics**
    - **Model-Based Decision Making:** Optimization and Multi-Criteria Systems; Structure of Mathematical Models for Decision Support; Certainty, Uncertainty, and Risk; Decision Analysis with Decision Tables and Decision Trees
    - **Modelling and Analysis:** Heuristic Search Methods and Simulation; Problem-Solving Search Methods; Genetic Algorithms and Developing GA Applications.
    - **Automated Decision Systems and Expert Systems:** Automated Decision Systems; Basic Concepts of Expert Systems; Structure of Expert Systems and Knowledge Engineering.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Demonstrate an in-depth the conceptual and methodological knowledge of intelligent systems for business analytics in managerial roles.
- Design the overall architecture for functioning business intelligence systems for descriptive analytics with the supporting data warehousing and data-integration applications.
- Critically analyse architectural models and develop functioning business intelligence systems for predictive analytics with the supporting data mining and predictive modelling applications.
- Carry out research on emerging business intelligence systems for prescriptive analytics with the supporting automated decision making systems and expert systems.

- Expertly analyse and synthesise the deluge of data into actionable information using business knowledge engineered from the intelligent systems.

Assessment:

Assessment will contain following components.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	10%	
Research Study	Formative	10%	
Assignment	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of at least 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Sharda, Ramesh, et al. Business Intelligence and Analytics: Systems for Decision Support. Prentice Hall, 2014.

Reference Book(s):

Delen, Dursun. Real-world data mining: applied business analytics and decision making. FT Press, 2014.

Haykin, Simon S., et al. Neural networks and learning machines. Pearson, 2009.

Russell, Stuart, and Peter Norvig. "Artificial Intelligence - a modern approach." Third Edition, Pearson, 2010.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Larson, Deanne, and Victor Chang. "A review and future direction of agile, business intelligence, analytics and data science." International Journal of Information Management 36.5 (2016): 700-710.

Işık, Öykü, Mary C. Jones, and Anna Sidorova. "Business intelligence success: The roles of BI capabilities and decision environments." Information & Management 50.1 (2013): 13-23.

Lim, Ee-Peng, Hsinchun Chen, and Guoqing Chen. "Business intelligence and analytics: Research directions." ACM Transactions on Management Information Systems (TMIS) 3.4 (2013): 17.

18) MITS6001: Cloud Computing

UNIT DESCRIPTION:

This unit provides a comprehensive coverage of Cloud concepts and capabilities across the various cloud service provisioning models including Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS) and Business Process as a Service (BPaaS). The unit discusses various practical aspects of cloud computing service such as business models, typical stakeholder concerns, multi-tenancy, public/private deployment options, reference architecture, offerings and related engineering aspects of above mentioned service provisioning model.

Students will gain a strong understanding on the essential constituents of cloud computing eco systems and the different players involved. Using the skills imparted in the unit and adopting the research ideas gained through study of emerging research, students will be prepared to evaluate the intricacies, implications, benefits and risks and be able to prepare business cases for moving to the cloud paradigm. Students will gain expertise over time to systematically migrate traditional applications that was internally hosted into one of the chosen cloud service provisioning models.

Pre-requisites:
MITS4004, MITS5004
Students who have equivalent knowledge of the prerequisite units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 6

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study, which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Introduction to Cloud Computing**:
    - Cloud adoption from a business perspective – business models, challenges, return of investment, factors that influence such decision making and risks/issues in cloud adoption.
    - Cloud computing roles such as provider, consumer, and carrier.
    - Types of cloud service adoption such as Infrastructure, Platform, Data Business Processes and Software.
    - General cloud application reference architecture, cost modelling, licensing, capacity planning, service level agreement.
    - Strategic issues such as governance, policies, security, data recovery, privacy, network/bandwidth needs and typical cloud application characteristics.
- **Infrastructure as a Service (IaaS)**:
    - The concept of virtualization and its influence on IT infrastructure performance and scalability. Issues related to storage and data with relevance to cloud hosting.
    - Secured infrastructure cloud hosting options, resources, costing and reference architecture.
    - Cloud usage monitoring systems, resource replication models, elasticity, load balancing, resource pooling and redundant storage architecture as relevant to Infrastructure as a Service.
    - Case studies of public IaaS vendor offering such as Amazon AWS, Eucalyptus and Open stack.
- **Platform as a Service (PaaS)**:
    - Understand platform services such as monitoring and management, application servers, messaging, data management, development and testing, integration and business intelligence.
    - Service development and deployment strategies. PaaS vs anchored PaaS.
    - Middleware considerations such as scalability, reliability, non-functional attributes along with security platform offerings.
    - Case studies of public PaaS vendor offerings such as IBM Bluemix, Microsoft Azure and Google App Engine.
- **Software as a Service (SaaS)**:
    - Migrating from application service providing to software as a service.
    - Influence of multi-tenancy in software architecture and layering. Maturity, driving forces and sales models used in SaaS.
    - SaaS economics, deployment models, customization and configuration issues.
    - Application and Data multi-tenancy spectrums in SaaS hosting. SaaS solution development, migration and application usage optimization.
    - Case studies of public SaaS horizontal vendor offerings such as Google, Zoho, SalesForce, SAP, Oracle and Cisco. Case studies of public SaaS vertical vendor offerings such as SmartStream.
- **Business Process as a Service (BPaaS)**:
    - Overview of BPM on the Cloud (i.e., BPaaS vs. managed business services and BPO) and BPaaS sample solutions (e.g., accounts payable, media planning, order management, clinical data management, MRO process, sentiment analysis, production management).
    - Key process components of BPaaS platform services such as process model, rules engine, portal, reporting, administration, integration and collaboration are discussed. Same offerings based case studies.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Critically evaluate the user requirements and business model and independently assess their suitability for transitioning to cloud based deployment using one of the provisioning models such as Infrastructure as a Service (IaaS), Platform as a Service (PaaS), Software as a Service (SaaS), and Business Process as a Service (BPaaS).
- Scientifically evaluate and recommend the use of appropriate cloud reference architecture for the chosen IaaS or PaaS or SaaS or BPaaS offering.
- Present to stakeholders the cloud related issues with regard to Computer Networks, Hosting, Privacy, Migration and Security issues and create workable implementation plans addressing these concerns.
- Carry out research, critically analyse, choose and implement cloud services for existing applications as appropriate.

Assessment:

Assessment will contain following components.

Assessment Component	Assessment Type	Weighting	Hurdle?
Research Study	Formative	10%	
Project	Summative	40%	Yes
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of at least 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Erl, Thomas, Ricardo Puttini, and Zaigham Mahmood. Cloud Computing: Concepts, Technology, & Architecture. Pearson Education, 2013.

Reference Book(s):

Weinman, Joe. Cloudonomics: The business value of cloud computing. John Wiley & Sons, 2012.

Kavis, Michael J. Architecting the cloud: Design decisions for cloud computing service models (SaaS, PaaS, AND IaaS). John Wiley & Sons, 2014.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Moreno-Vozmediano, Rafael, Rubén S. Montero, and Ignacio M. Llorente. "Key challenges in cloud computing: Enabling the future internet of services." IEEE Internet Computing 17.4 (2013): 18-25.

Garg, Saurabh Kumar, Steve Versteeg, and Rajkumar Buyya. "A framework for ranking of cloud computing services." Future Generation Computer Systems 29.4 (2013): 1012-1023.

Oliveira, Tiago, Manoj Thomas, and Mariana Espadanal. "Assessing the determinants of cloud computing adoption: An analysis of the manufacturing and services sectors." Information & Management 51.5 (2014): 497-510.

19) MITS6002: Business Analytics

UNIT DESCRIPTION:

The focus of this unit is to introduce foundations of business analytic techniques. The unit will discuss basic descriptive statistics and decision modelling techniques. The unit introduces segmentation analytics, decision models and regression models. Unit covers statistical analyses such as hypothesis testing, correlation analysis, control groups versus test groups. The unit discusses the various stages of analysis starting from the preparation of raw data, exploratory data analysis, descriptive analysis, statistical analysis to predictive analysis.

Students will able to apply the knowledge delivered in this unit to predict future business trends using statistical methods like moving averages, exponential smoothing and linear regression. They would be able to critically assess various analytics models published in research articles and employ the most appropriate modelling tool to improve business decisions over time.

Pre-requisites:
MITS4001 and evidence of statistics/quantitative methods study at under graduate program
Students who have equivalent knowledge of the prerequisite units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 6

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Introduction to Business Analytics**:
    - The value of business analytics and producing insights from information through analytics.
    - Determine data analytics objectives from business objectives.
    - The three basic types of analytics (descriptive vs predictive vs prescriptive) and receiving return of investment from an analytics project.
    - Analytics techniques including data mining, statistical, data querying, data warehousing, regression analysis and machine learning.
- **Descriptive Statistics:**
    - Types of data, creating data distribution and modifying data.
    - The difference between statistics and business analytics.
    - Measures of location, variability and association between variables.
    - Hypothesis testing, control groups versus test groups and analysing distributions.
    - Descriptive statistics, basic statistical tests and comparing test data.
- **Correlation & Regression Analysis**:
    - Simple linear regression mode and multiple regression models.
    - Factor Analysis, Principal Components Analysis, Multidimensional Scaling, Cluster Analysis and Discriminant Analysis. Data Survey and Collection Issues (Sampling, Interview, Survey and Experiments).
    - Probabilistic risk analysis and segmentation analytics.
- **Decision Modelling**:
    - Types of decision models, context diagrams, data visualization and mathematical models.
    - Decision making method and roles in decision making.
    - Factors such as biases, emotions, bounded rationality and managing irrationality.
    - Alignment, enablement, observation, reporting and communication of decisions.
    - Example case study discussion for selected decision models.
    - Applications of analytics in various domains such as financial analytics, human resource analytics, marketing analytics, health care analytics, supply chain analytics web analytics, sports analytics and analytics for government & non-profit organizations.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Demonstrate an in-depth the conceptual and methodological knowledge of analytical methods and techniques for business analytics
- Expertly identify and resolve practically relevant business analytics questions and issues
- Conduct research on a collection of business cases and perform statistical analysis as also interpret these outcomes to recommend appropriate business directions.
- Critically analyse a variety of business domains and adopt business analytics models appropriate to the domain that requires quantitative techniques for decision making.
- Recommend appropriate analytic tools and techniques to resolve complex business analytics problems in various industry sectors.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	10%	
Research Study	Formative	10%	
Assignment	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

J. Camm, J. Cochran, M. Fry, J. Ohlmann, and D. Anderson, Essentials of Business Analytics, Cengage Learning, 2014.

Reference Book(s):

E. Stubbs, Delivering Business Analytics: Practical Guidelines for Best Practice. John Wiley & Sons, 2013.

T. H. Davenport, B. E. Bensoussan, and C. S. Fleisher, The Complete Guide to Business Analytics (Collection). FT Press, 2012.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Holsapple, Clyde, Anita Lee-Post, and Ram Pakath. "A unified foundation for business analytics." Decision Support Systems 64 (2014): 130-141.

Seddon, Peter B., et al. "How does business analytics contribute to business value?." Information Systems Journal (2016).

Acito, Frank, and Vijay Khatri. "Business analytics: Why now and what next?." (2014): 565-570.

20) MITS6003: Enterprise and IT Solutions Architecture

UNIT DESCRIPTION:

This unit provides enterprise architecture as an approach for designing, planning, implementing and governing an enterprise information technology architecture. This unit also discusses robust, scalable and maintainable software architectures. The key topics of focus are architectural concepts, software qualities such as availability, performance and security and reusing of architectural patterns. This unit examines the process transition from architecture to design of solutions discussing the various choices made along the way.

The students will be able to fit solution architecture into the broader context of enterprise architecture for the organization. The course will broaden students' architecture skills. Students will be able to implement over time enterprise and solution architecture patterns, standards and delivery practices for organisations by applying the knowledge imparted in the unit as well as through their research in emerging Architectural models.

Pre-requisites:

MITS4001, MITS4003, MITS4004, MITS5001

Students who have equivalent knowledge of the prerequisite units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:

Nil

Subject weighting

6 credit points

Mode of Delivery & Teaching approach:

Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit

Level 6

Duration

1 Semester

Contact Hours & Workload:

3 Hours of Lecture / Classroom Discussion per week

2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours / Week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Enterprise Architecture**

- Architecting the whole enterprise including business processes, technologies, and information systems of the enterprise
- Three major types of architecture frameworks
  - General Purpose Frameworks – Example TOGAF, IEOF, Zachman
  - Business Specific Frameworks - Examples MODAF, FEAF, TEAF, DODAF
  - Vendor Specific Frameworks - Examples include: Oracle EA and Microsoft Value Realization Framework
- Integration and standardisation requirements of the company's operating model
- Four Key Components: Business Architecture, Information Architecture, Application Architecture and Technology Architecture

- **Business Architecture**
  - Business Strategy and Capabilities
  - Approaches and frameworks for business architecture
  - Process reference model
  - Identifying and using business qualities.
- **Information Architecture**
  - Data architecture
  - Conceptual business entity modelling
  - Logical data modelling
  - Detailed information representation
- **Application Architecture**
  - Application reference architecture
  - Level of precision required, critical resources and critical workloads
  - Capacity Planning
  - Modelling languages employed for the application architecture description
  - Security concepts and architecture
  - Risk management, security strategies and processes
  - Designing highly available and scalable application architecture
  - Technologies and patterns used
  - Maintainability Metrics, Strategies and Processes.
  - Business process integration and its relation to application architecture.
- **Technology Architecture**:
  - IT architecture definition, description, styles and role.
  - Common Software Qualities Models.
    - McCall's model of software quality attributes and the hierarchy.
    - Boehm's definition for software quality attributes.
  - Software Quality Attribute Scenarios.
  - Performance requirements, measurement, simulation, tuning and capacity planning activities.
  - Implementing performance goals and verifying/monitoring if those goals are being met.
  - Technologies and patterns involved in setting, validating and monitoring the set goals.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Synthesize complex business and IT inputs to critically analyse techniques when developing customized enterprise architecture to meet an organization's needs.

- Reflect on the requirements, constraints and enterprise computing environment to create reference architecture models for business, information, application and technology.
- Independently design the architecture with emphasis on the software quality attributes and their trade-offs; including defining non-functional requirements, determining the architectural drivers, and identifying the architectural constraints.
- Prepare, present and communicate to stake holders an Enterprise Architecture that factors in all enterprise IT factors and capacity plans.
- Lead and manage complex Enterprise Architecture projects to achieve effective integration of application components espousing concrete architectural thinking.
- Research on emerging IT and Software Architectures through a review of research and white papers to derive the most suited architecture for an Enterprise Problem.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	10%	
Research Study	Formative	10%	
Project	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Danny Greefhorst and Erik Proper, Architecture Principles: The Cornerstones of Enterprise Architecture, Springer, 2011.

Reference Book(s):

McGovern, James. A practical guide to enterprise architecture. Prentice Hall Professional, 2004.

Len Bass, Paul Clements and Rick Kazman, “Software Architecture in Practice”

Version, T. O. G. A. F. "9, the open group architecture framework (togaf)." The Open Group 1 (2009).

IEEE STD 1471-2000, “IEEE Recommended Practice for Architectural Description of Software-Intensive Systems”

ISO 9126 Product Quality (Quality model, internal metrics, external metrics & quality in use metrics)

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Foorthuis, Ralph, and Sjaak Brinkkemper. "Best practices for business and systems analysis in projects conforming to enterprise architecture." Enterprise Modelling and Information Systems Architectures 3.1 (2015): 36-47.

Bernaert, Maxime, et al. "Enterprise architecture for small and medium-sized enterprises: a starting point for bringing EA to SMEs, based on adoption models." Information Systems for Small and Medium-sized Enterprises. Springer Berlin Heidelberg, 2014. 67-96.

Simon, Daniel, Kai Fischbach, and Detlef Schoder. "An exploration of enterprise architecture research." Communications of the Association for Information Systems 32.1 (2013): 1-72.

21) MITS6004: Enterprise Resources Planning

UNIT DESCRIPTION:

This unit provides an overview of ERP systems and supply chain business processes. The unit details the critical factors and implementation strategies that ensure successful enterprise systems. The unit provides an in-depth discussion on the informational, knowledge, and decision-making capabilities of enterprise systems. Case studies on implementation, configuration, operational and reporting functionalities offered by typical enterprise systems modules like materials management (MM), supply chain management (SCM), customer relationship management (CRM), financials, projects and human resource management (HRM) are discussed.

Students will be able to effectively implement, configure and customise enterprise resource systems to run business operations more efficiently and effectively. Students will be able to use packaged software to independently plan the enterprise resources set up error-free, optimal business processes workflows that would support accounting, management reporting and effective decision-making. Students would be prepared to carryout extensive research on various ERP offerings and prepare a comparative analysis on the suitability of these in given organisational context.

Pre-requisites:
MITS4001
Students who have equivalent knowledge of these units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:
Nil

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 6

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Classroom Discussion per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study, which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Introduction to Enterprise Resource Planning (ERP)**:
    - Fundamentals of enterprise resource planning (ERP), system concepts, and the importance of integrated information systems in an organization.
    - ERP Modules such as procurement, production, and sales business processes using ERP system.
    - Overview and comparison of various ERP solutions in market.
- **ERP Design and Implementation**:
    - Technical overview of Enterprise Resource Planning Systems and their impact on organizations.
    - The concepts, fundamentals, framework, general information technology context, the technological infrastructure, and integration of business enterprise-wide applications.
- **Supply Chain Management:**
    - Systems approach to the planning, analysis, design, development, and evaluation of supply chain management.
    - Key activities that lead to integration of information and material flows across multiple organizations in the supply chain.
    - Implementation Case Studies in materials, operations, supply chain management.
- **Customer Relationship Management:**
    - Identification (targeting), acquisition, retention, and development (expansion) of (profitable) customers.
    - Effective and efficient management of customers with utilization of information technology using ERP.
    - Implementation case studies for CRM
- **Financials:**
    - Introduction to the basic principles and techniques of financial accounting and ERP implementation case studies.
    - Accounting process and the interpretation and use of basic financial statements.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Critically analyse business/enterprise activities, workflow and processes to identify problems, weaknesses, strengths, threats, opportunities, stakeholders and entities interacting with the enterprise.
- Explain the scope of common Enterprise Systems (e.g., material management, supply chain management, customer relationship management, human resource management and financials).
- Effectively communicate and assess an organisation's readiness and strategies for enterprise system implementation with professional assessments and in depth technical arguments.
- Conduct product evaluation research with regard to the features, functionalities, costs and benefits offered by various ERP tool and be able to implement a selected ERP took that best meets business operations and managerial needs.
- Summarize how enterprise systems integrate business functional areas into an enterprise-wide information system through analysis and business process modelling using tools such as Salesforce ERP.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	10%	
Research Study	Formative	10%	
Project	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Motiwalla, Luvai F., and Jeffrey Thompson. Enterprise systems for management. Upper Saddle River, NJ: Pearson Education, 2012.

Reference Book(s):

Magal, Simha R., and Jeffrey Word. Essentials of business processes and information systems. Wiley Publishing, 2009.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Norton, Andrew Lawrence. "Enterprise resource planning II-A review of critical success factors." International Journal of Computer Science and Information Security 13.11 (2015): 5.

Sundtoft Hald, Kim, and Jan Mouritsen. "Enterprise resource planning, operations and management: Enabling and constraining ERP and the role of the production and operations manager." International Journal of Operations & Production Management 33.8 (2013): 1075-1104.

Bazán, William, et al. "Analysis of Risk Factors of ERP (Enterprise Resource Planning) Systems Information Technologies." Technologies and Innovation: Second International Conference, CITI 2016, Guayaquil, Ecuador, November 23-25, 2016, Proceedings 2. Springer International Publishing, 2016.

22) MITS6005: Big Data

UNIT DESCRIPTION:

The rapid expansions in technologies and devices and advent of social networking, internet of things has resulted in extensive generation of data whose volume goes beyond the capabilities of storage and processing within traditional databases and are now formally called Big Data. There exists a strong need for the business world to take advantage of these large datasets as a source for new economic value and innovation.

This unit provides students a detailed and in-depth understanding of Big Data Solutions on a distributed computing platform (cloud hosted or otherwise). Through advanced technical knowledge on various aspects of Big Data such as distributed systems, distributed file systems, NoSQL technology, resilient distributed data or tuple spaces and practical training on tools related to the tuple storage, processing, loose coupling analysis and visualization, this unit prepares the student comprehensively on Big Data Engineering. Through a variety of case studies such as email spam filters, search keyword suggestions, profile matching based on numeric attributes and autocorrect facilities influence our day-to-day activities as well as extensive business data generated through network of interconnected systems and devices.

Upon completion of the unit, students will be able to expertly apply big data solution in a variety of business contexts. Over time, students would be able to develop and implement big data solutions using state of art data science & engineering technologies. In addition, the unit prepares students to review recent research advances published in literature and expand on this to evolve further models for Big Data solutions.

Pre-requisites:

MITS4001, MITS4003, MITS5002

Though not essential, evidence of statistics/quantitative methods study at under graduate program and database related project experience in industry would help in students better learning outcomes.

Students who have equivalent knowledge of the prerequisite units through prior study or equivalent work experience may be deemed to have met these pre-requisites. Such cases would need prior approval of Dean.

Prohibitions:

Nil

Subject weighting

6 credit points

Mode of Delivery & Teaching approach:

Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit

Level 6

Duration

1 Semester

Contact Hours & Workload:

3 Hours of Lecture / Classroom Discussion per week

2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- **Introduction to Big Data**:
    - **Introduction**: Introduction to Distributed and Parallel Computing Platforms; Introduction to characteristics of Big Data; Introduction to Hadoop Eco System.
- **Distributed File Systems and Data Ingestion:**
    - **Distributed File System:** Introduction to Distributed File Systems; Design features of the scalable, fault-tolerant, cost-efficient storage for Big Data;
    - **HDFS:** Typical architecture for file service implementation across multiple machines to achieve high-performing, distributed transacting, scalable and fault-tolerant file systems.
    - **Data Ingestion:** Fundamental concepts related to Data Ingestion; Prepare and manage data import/export efficiently from multiple data sources, with a reasonably good performance; Study of Data Ingestion patterns.
    - **Sqoop and Flume:** Understand and use Data Ingestion Tools such as Sqoop and Flume.
- **Distributed Data Processing:**
    - **NoSQL:** Basics of NoSQL and NewSQL; Comparison between NoSQL and Traditional Relational Database Management Systems. Aggregated data model, principles of sharding, replication, quorums and CAP theorem; Types of data models: - document, graph, key-value and column oriented data models.
    - **HBase – The Columnar Data Store:** Apache HBase - the Hadoop distributed, scalable, big data store. Hosts very large tables; Provides Bigtable-like capabilities on top of Hadoop and HDFS; Strictly consistent reads and writes; Automatic and configurable sharding of tables; Automatic failover support between Region Servers.
    - **Hive Engine -** The Apache Hive is a data warehouse that facilitates reading, writing, and managing large datasets residing in distributed storage using SQL; Structure can be projected onto data already in storage.
- **Distributed Compute Framework:**
    - **Compute Cluster Features**: Cluster computing architecture including resource sharing, node architecture and massive parallel processing; the YARN resource management architecture of Hadoop platform.
    - **Map Reduce Framework:** MapReduce is a programming model and an associated implementation for processing and generating big data sets with a parallel, distributed algorithm on a cluster. The model is inspired by the map and reduce functions commonly used in functional programming.
    - **Spark Framework and Resilient Distributed Data Sets:** Introduction to Spark Framework; the basic functionality offered by Spark engine, including components for task scheduling, memory management, fault recovery and interaction with storage systems; Working with resilient distributed datasets (RDDs); aggregator and broadcast operations on RDDs; the runtime architecture and execution modes of the distributed big data compute cluster.

- **Advanced Big Data Applications:**
    - **Advanced Query Language**: Spark SQL to load data from traditional database, process it, and store it to HDFS.
    - **Machine Learning**: Solving automation problems using RDDS and Spark machine learning libraries; preparing of RDDs, using feature extraction algorithms, using classification algorithms and model evaluation.
    - **Stream Processing**: Solving stream processing problems using RDDS and Spark processing frameworks.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Analyse the growth of big data and need for a scalable processing framework. Synthesise the fundamental characteristics, storage, analysis techniques and the relevant distributions.
- Expertly apply techniques to perform big data query manipulation, evaluate various data storage option and type of aggregated data modelling. Through a critical study, choose an appropriate storage model based on the application requirements for processing large amounts of structured and unstructured data.
- Independently perform data manipulation and querying (including updates, transactions, and indexes) big data applications dealing with high volume using NoSQL. Organize, store the collected data and manipulate by crafting queries. For example, using Hive, HBase and related data tools.
- Carry out research on emerging Big Data technologies to evolve models/solutions such as configurable and executable compute jobs on top of using distributed and shared memory architecture and Resilient Distributed Data Sets (RDDs).
- Implement typical solution use cases in big data context using technologies such as MapReduce and Spark Framework and using ecosystems such as Hadoop (or other similar platform).

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Case Studies & Presentation	Formative	10%	
Research Study	Formative	10%	
Project	Summative	30%	
Written Examination	Summative	50%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task

will be provided within the assessment document of the unit, when the assessment task is released to the students.

Text Book(s):

Erl, Thomas, Wajid Khattak, and Paul Buhler. Big Data Fundamentals: Concepts, Drivers & Techniques. Prentice Hall Press, 2016.

Reference Book(s):

Eadline, Douglas. Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem. Addison-Wesley Professional, 2015.

Lin, Nathaniel. Applied Business Analytics: Integrating Business Process, Big Data, and Advanced Analytics. FT Press, 2014.

Agneeswaran, Vijay Srinivas. Big Data Analytics Beyond Hadoop: Real-Time Applications with Storm, Spark, and More Hadoop Alternatives. FT Press, 2014.

Research Readings:

A selection of research articles from below will be discussed in lectures and students would be tasked to explore further research trends relevant to the unit content. They will present or submit a research study report for assessment as indicated in the assessment table above. As further research findings evolve the unit lecturer may supplement or substitute these to keep the research delivery current and updated.

Kambatla, Karthik, et al. "Trends in big data analytics." Journal of Parallel and Distributed Computing 74.7 (2014): 2561-2573.

Moniruzzaman, A. B. M., and Syed Akhter Hossain. "Nosql database: New era of databases for big data analytics-classification, characteristics and comparison." arXiv preprint arXiv:1307.0191 (2013).

Assunção, Marcos D., et al. "Big Data computing and clouds: Trends and future directions." Journal of Parallel and Distributed Computing 79 (2015): 3-15.

23) MITS6011: Advanced Research Topics in Information Technology

UNIT DESCRIPTION:

The unit is designed for graduate level students to enhance their scholarship through research based study on an advanced topic in information technology. The unit initially provides the core essentials of research methodology directed towards technical research, which consists of elements such as literature survey, defining research question, experimental design etc. After introducing these elements, the student applies these to carry out a research activity on a topic in an emerging area of IT.

Possible research areas are algorithms, artificial intelligence, bio-computation, database & information systems, distributed systems/ubiquitous computing, geometric computation, graphics, architecture, user experience design, internet systems & infrastructure, knowledge representation & reasoning, machine learning, natural language & speech processing, networking, operating systems, programming languages & compilers, robotics, vision & physical modelling, scientific computing, security and privacy, software engineering and design, and systems reliability and dependability.

Students will gain an in depth experience in doing research and would be able to apply this learning outcome to further their research in IT area.

Pre-requisites:
Successful completion of all core units and at least 1 Elective or Advanced Elective in which topic the student plans to do his research study.

Prohibitions:
Students are not permitted to enrol for both MITS6011 and MITS6012 concurrently. Those who wish to pursue both research electives should seek Dean's approval.

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 6

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Guided learning per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study, which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

CONTENTS:

- Research Methodology
    - Introduction to Research
    - Literature Survey methods
    - Experimental design for practical IT problems.
    - Research approaches to theoretical and practical computer science.
- Research work on identified technical problem.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Understand the research methods and be able to apply the right research method for addressing research problems in technical IT discipline.
- Identify components of literature survey and be able to critically analyse published work and comment on the technical merits and limitations of the published work.
- Independently set up lab based research experiments, perform research explorations and theoretical computational research in IT
- Independently carry out theoretical/empirical research in a chosen, emerging area in Information Technology and prepare/publish a paper based on their research.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Research Proposal	Formative	20%	
Research Paper	Summative	60%	Yes
Viva Voce	Summative	20%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Reference Book(s):

Creswell, J. W. Research design: Qualitative, quantitative and mixed methods approaches. 4th Ed. Thousand Oaks, CA: Sage., 2014.

Journal Articles suggested by supervisor based on the area chosen for research.

24) MITS6012: Advanced Research Topics in Information Management

UNIT DESCRIPTION:

The unit is designed for graduate level students to enhance their scholarship through research based study on an advanced topic in information management. The unit initially provides the core essentials of research methodology focussing on managerial and survey based research which consists of elements such as data collection, survey design, sampling, statistical analysis etc. After introducing these element, the student applies these to carry out a research activity on a topic in an emerging area of Information management.

Possible research areas are organizational processes, managing technology & innovation, resources management & sustainable development, social entrepreneurship, corporate responsibility, ethics & accountability, accounting & finance, knowledge management, operations management supply chain management, project management and SME.

Students will gain an in-depth experience in doing research and would be able to apply this learning outcome to further their research in information management domain.

Pre-requisites:
Successful completion of all core units and at least 1 Elective or Advanced Elective in which topic the student plans to do his research study.

Prohibitions:
Students are not permitted to enrol for both MITS6011 and MITS6012 concurrently. Those who wish to pursue both research electives should seek Dean's approval.

Subject weighting
6 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided practical laboratories/tutorials

Level of Unit
Level 6

Duration
1 Semester

Contact Hours & Workload:
3 Hours of Lecture / Guided learning per week
2 Hours of Consultation per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on tutorial exercises and practical lab exercises regularly in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's homework and to provide guidance on tutorials and practical work.

Content

- Research Methodology
    - Introduction to Research
    - Quantitative Research Methods
    - Qualitative Research Methods
    - Mixed Method Design
    - Research methods applied to information management domain
- Research work on identified emerging information management topic.

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Understand the research methods and be able to apply the right research method for addressing research problems in information management discipline.
- Identify components of literature survey and be able to critically analyse published work and comment on the technical merits and limitations of the published work.
- Independently design survey based research, collect and analyse data using statistical packages and draw up research inferences to make projections and recommendations.
- Carry out research in a chosen area of information management and prepare a paper based on their research study.

Assessment:

Assessment will contain following summative and formative assessments.

Assessment Component	Assessment Type	Weighting	Hurdle?
Research Proposal	Formative	20%	
Research Paper	Summative	60%	Yes
Viva Voce	Summative	20%	Yes

To pass the unit students are expected to achieve an overall mark of 50% or more. In addition, where an assessment component is marked as “hurdle”, students are required to achieve at least 40% in those hurdle components in addition to an overall mark of 50% to achieve a pass grade in the unit.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Reference Book(s):

Creswell, J. W. Research design: Qualitative, quantitative and mixed methods approaches. 4th Ed. Thousand Oaks, CA: Sage., 2014.

Journal Articles suggested by supervisor based on the area chosen for research.

25) MITS6500: Capstone Project

UNIT DESCRIPTION:

The Capstone Project provides an opportunity for students to apply knowledge acquired during the MITS course to a sizeable real-life project. During the project, students engage in the entire process of a typical IT project which could be either of infrastructure nature or software development. This provides them a well-rounded experience on the end-to-end process in a chosen area in IT.

The Capstone Project provides an opportunity for students to apply knowledge acquired during the MITS course to a sizeable IT project. During the project, students engage in the entire process of a typical IT project which could be either of infrastructure nature, analytics or software development. This provides them a well-rounded experience on the end-to-end process in a chosen area in IT.

A typical project in the software engineering domain may involve software development addressing full life-cycle development consisting of requirements gathering, project management, systems analysis, software design, programming, testing, release and documentation.

A typical project in the architecture domain may involve architectural requirement gathering in terms of IT, software & data capabilities, conducting gap analysis by extensively studying the current system while taking into account the existing IT infrastructure, technology platforms, applications and data resources; this is followed by proposal of the new generation architecture model as a blueprint including identified architectural principles, paradigms, hierarchy, distribution, elasticity, messaging, on-demand cloud deployments, measurements, security, performance and interaction patterns amongst others. Selected portions of the new proposal can be demonstrated via prototypes as deemed necessary.

A typical project in the analytics domain may involve management of the complete large scale distributed data set lifecycle stages including well-defined business case evaluation, meaningful data sources identification, data acquisition and filtering, data extraction, data validation & cleansing, choice of representation, data analysis and data visualization. Data analysis usually involves aggregation modelling (such as descriptive or diagnostic analytics), mathematical & intelligent processing (such as prescriptive or predictive analytics) and result utilization (such as outcome based analytics) that help businesses make well-informed decision. Depending on the nature and scope of project it may be either individual *(default)* or small team based with significant identifiable individual tasks, roles and deliverables.

Students will usually carry out an industry targeted simulated project proposed by VIT Academic Staff under a simulated/studio environment *(the default option)*. Students may apply for an actual Australian based industrial attachment (in lieu of the simulated project) if an industrial sponsor is available. This requires provision of a detailed proposal, consistent with VIT policies, which will be assessed for learning outcomes, size, scope and relevance by VIT.

Students may also elect a research study option *(in lieu of a simulated industry based project)*; in this case they will work on a research problem suggested by VIT Academic Staff to carry out a review of literature, carry out critical analysis, propose models or alternative approaches and come up with a research report that showcases the student's ability to expand the frontiers of knowledge or to solve a practical IT problem faced by industry through research models.

Pre-requisites:
Successful completion of all core units.

Prohibitions:
Nil

Subject weighting

12 credit points

Mode of Delivery & Teaching approach:
Face to face lectures, consultations and self-guided research and technology exploration, simulated studio.

Level of Unit
Level 6

Duration
2 Semesters
Students can choose to complete this as a 1-Semester unit with double work hours per week to meet the project scope.

Contact Hours & Workload:
2 Hours of guided learning through consultation with VIT Advisor per week
3 Hours of project work per week

Students are expected to put in approximately 6-8 hours/week of self-study which would include practicing on library work, researching, setting up lab environments, preparing reports, coordinating project activities in order to satisfy the reading and assessment expectations. The consultation sessions would be used to review the weekly tasks and student's progress and to provide guidance on technical and project management work.

CONTENTS:

- Requirement Analysis and Problem definition for the Capostone Project
- Managing sizeable projects
    - Defining project deliverable(s)/product(s) and associated requirements
    - Work breakdown structure
    - Project strategy and life-cycle
    - Project scheduling, required resources, cost estimation and budgeting
- Project plans
    - Risk analysis and risk planning and mitigation
    - Communication planning
    - Quality management plans
    - Validating stakeholder expectations
    - Change control over the project plan and procedures for updating and/or changing plans
- Information Technology Components
    - Evaluation and selection of infrastructure, software, architectural in the context of the project
    - Business value through IT project and analytics
- Report writing and presentation

LEARNING OUTCOMES:

At the successful completion of this unit, students will be able to:

- Critically analyse a set of requirements or problem to prepare detailed project management plan.
- Demonstrate a broad as well as in-depth knowledge of various emerging advanced IT technologies through the development of models or solutions that address the stated requirements or problem.
- Demonstrate comprehensive skills with regard to application of appropriate methodology to architect, design and implement solutions for the chosen project.
- Research alternate approaches to identify and address issues relating to the applicability and limitations of using particular approaches, evaluate technologies and provide expert judgement on the best approach to meet the requirements or solve the stated problem
- Communicate effectively and professionally with clients and system users.
- Reflect critically on the social, ethical and professional obligations in planning or advising.

Assessment method:

The assessment will contain following deliverables with group and individual components:

- Project Report (80%)
- Presentation & Viva Voce (20%)

Students are required to achieve at least 40% in the project report which will be blind marked by two assessors. In addition, they should clear the presentation to the satisfactorily complete the viva voce and secure an overall mark of at least 50% in the unit. The Presentation & viva voce may be conducted either on a face to face mode or through Skype or similar audio/video conferencing.

Assessment Guidelines

General guidelines for all assessment tasks are available in the Student Handbook / VIT MITS website that covers information regarding submission of assessments, marking guide, moderation, feedback and return of marked assessments. The Student Handbook also contains a summary of VIT's policies on plagiarism, late penalty, extensions, special consideration, and student support. Specific guidelines for each assessment task will be provided within the assessment document of the unit, when the assessment task is released to the students.

Reference Book(s):

References would be used based on the nature of the project and would be provided by the project supervisor at the commencement of the project.